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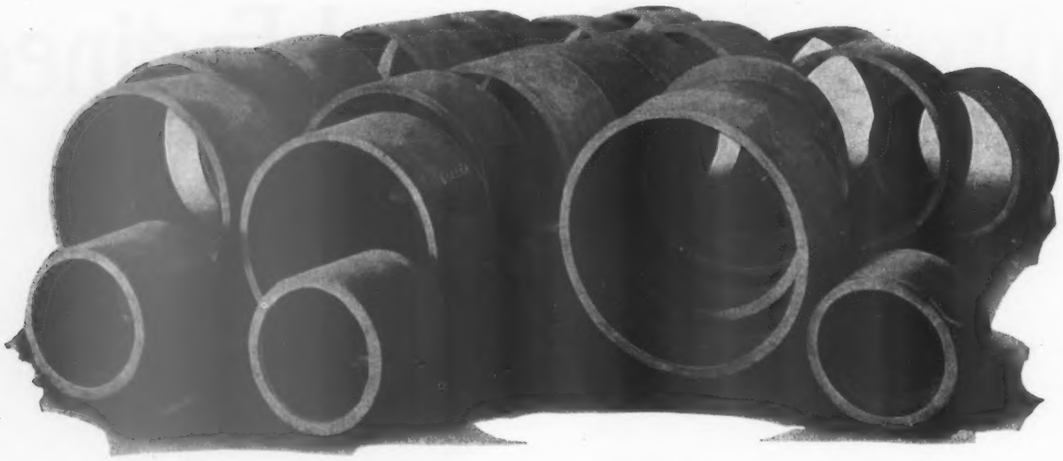

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THE BALDWIN LOCOMOTIVE WORKS

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Railway
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December - 1932

Ten-Ton All-Steel Four-Wheel Refrigerator Car

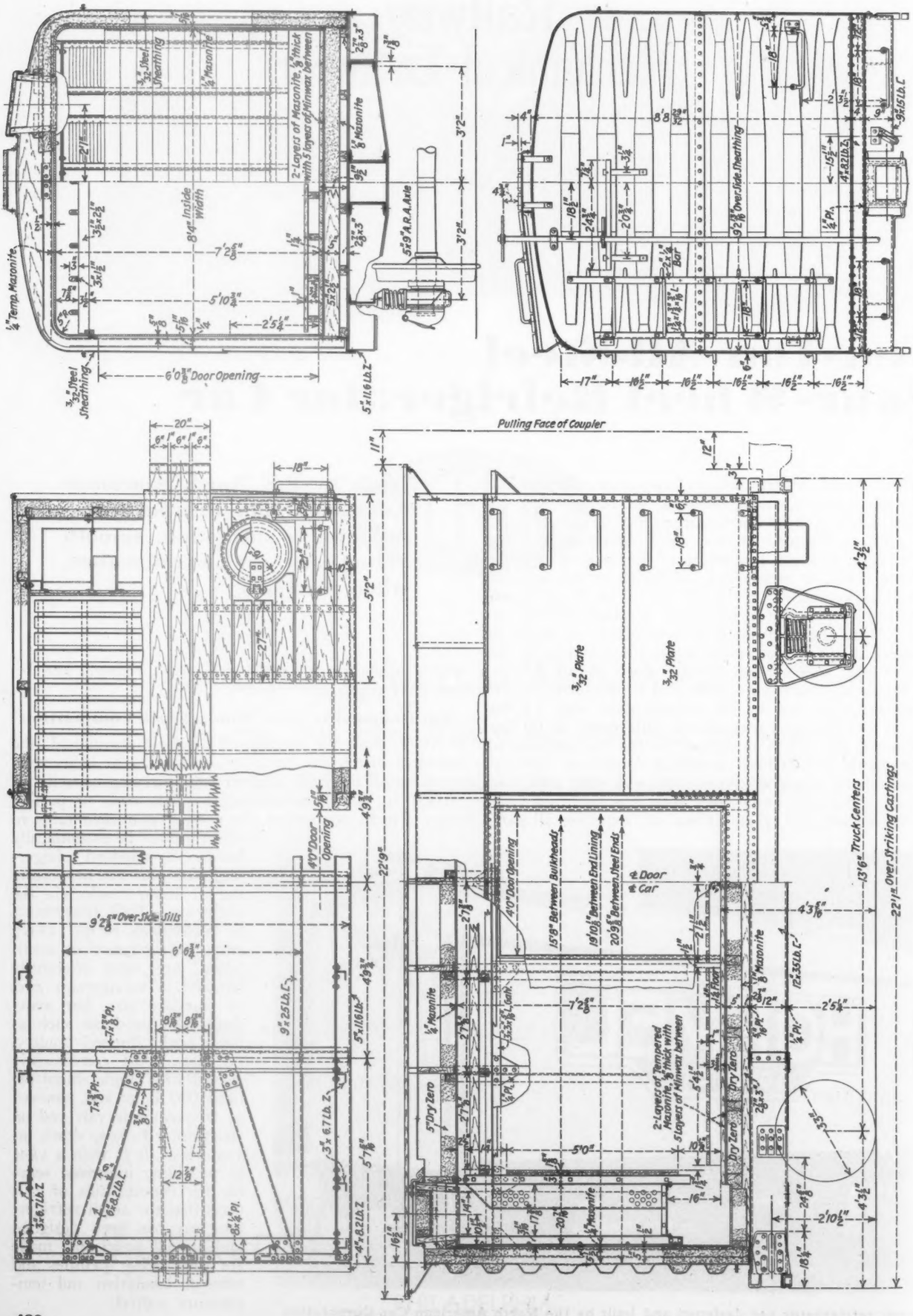
Built by the North American Car Corporation with particular attention to insulation, smooth riding and easy maintenance, when necessary

THE North American Car Corporation, Chicago, has developed a small, all-steel, ice-refrigerated car which closely follows European practice in car construction, but is designed to meet fully American Railway Association strength requirements for cars operated in modern trains at high speeds. Special springs are employed to promote easy riding of the car at all speeds and clasp brakes provide uniform and adequate braking effort. With the equivalent of five inches, or more, of effective insulation on sides, ends, floor and roof, the rate of heat transmission through the walls of this car is said to be about one-fourth that of the ordinary refrigerator car, and its ice consumption only 13 lbs. per hr. to maintain a temperature differential of 60 deg. Moreover, the car is designed for the maintenance of permanently satisfactory insulating conditions. By removing bolts along the side sills, end sills and door frames, the entire outer steel shell can be lifted from the fabricated steel frame of the car, exposing all parts of the insulation for ready inspection, removal and renewal, if required.

Ten-ton refrigerator car designed and built by the North American Car Corporation

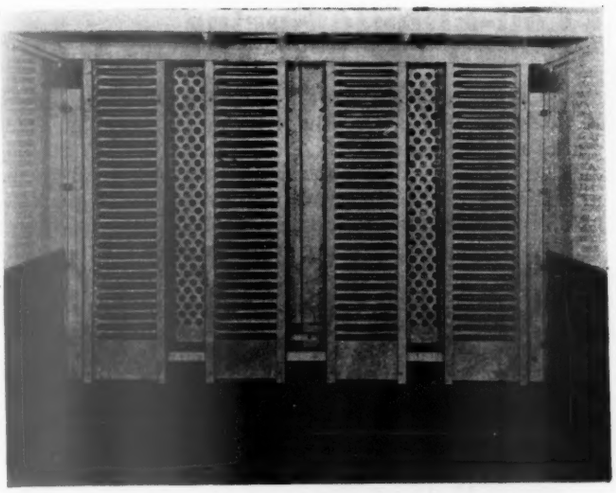
Car Designed to Meet Motor-Truck Competition

Aside from the mechanical features mentioned, the principal distinctive characteristic of the car is its relatively small size. With a nominal carrying capacity of 20,000 lb., it will accommodate small loads of perishables, which, because of the present minimum rates in effect, cannot be economically handled in standard refrigerator cars and are now moving in motor trucks via the highways. Bulk movements of perishables, requiring either refrigeration or ventilation, are most effectively handled in refrigerator cars of standard size, but many dealers in products such as beef, pork, dressed poultry, etc., are most conveniently served with single shipments of 20,000 lb., or less, received at frequent intervals and on short order to keep down inventories. It is with a view to providing improved service for commodities of this class that the small refrigerator car has been designed and special provisions made for easy riding qualities and efficient insulation and temperature control.



General arrangement of the 10-ton refrigerator car recently built by the North American Car Corporation

General arrangement of the 10-ton refrigerator car recently built by the North American Car Corporation



Interior view showing details of the ice bunker installed in one end of the car

The first 10-ton car of this type weighs about 27,000 lb., but it is expected that this weight will be reduced in subsequent cars to approximately 23,000 lb. by the use of pressings for certain parts, now made of structural steel shapes. The general dimensions of the car are given in the table. Cardwell F-3 friction-spring barrel-type draft gears are installed in standard 24-⅝-in. draft-gear pockets with cast-steel yokes and Type-D couplers. To promote easy riding and the damping of spring oscillation, the car weight is carried on standard A. R. A. double-coil springs supplemented by Cardwell friction truck springs. Eight-inch air-brake equipment is applied; also, the Superior hand brake and all standard safety appliances. Clasp brakes are of the American Steel Foundries Simplex type with a special design of brake-beam bearing arrangement to prevent oscillation of the brake-beams and hold the brake-shoes in correct alinement with the wheels.

General Dimensions of North American Five-Ton Refrigerator Car

Capacity	20,000	lb.
Light weight	23,000	lb.
Length over striking castings	22 ft. 1	in.
Length between end linings	19 ft. 10	in.
Inside length between bulkheads	15 ft. 8	in.
Width between side linings	8 ft. 4	in.
Inside height from floor to ceiling	7 ft. 2⅝	in.
Inside height from top of floor rack to beef rails	6 ft. 2½	in.
Outside width over side sills	9 ft. 2⅝	in.
Outside height from top of rail to the running board	13 ft. 11	in.
Height from rail to door sill	4 ft. 3¼	in.
Axle center to outside of striking castings	4 ft. 3½	in.
Wheel bases	13 ft. 6	in.
Wheels, one-wear steel	33	in.
Journals	5 in. by 9	in.

Details of the Underframe Construction

The car center sill is of standard cross-section area, being composed of two 12-in. 25-lb. channels, extending from end sill to end sill, and provided with top and bottom cover-plates. Between the center sills and each Z-section side sill is a 9-in. channel, extending the full height of the underframe, riveted to the cross-bearers, and to which the cast steel pedestals are riveted. The Z-section side posts, riveted to gussets on the side sills, are forged to smooth rounded corners at the top and joined at the top center line of the car. In place of a side plate, an angle section extending from corner post to corner post is riveted to gussets and post Z-sections. This serves as a support for the longitudinal beef-rail supports and as a backing for the door headers.

Bolted to the vertical Z-section posts are wood fillers which serve as a foundation for the inside lining, made of ¼-in. Masonite, a tempered pressed-wood product, designed to be impervious to moisture. Six 2-⅞-in. by 3-in. longitudinal floor supports rest on the underframe and to them are bolted the 2½-in. by 5-in. floor stringers which extend crosswise of the car at intervals rather than lengthwise as is common practice in refrigerator-car construction. This arrangement of cross floor stringers holds the 5-in. of Dry Zero floor insulation in place without tacking, and the insulation may be readily taken out or re-applied at any time when the side sheathing is removed.

Above and below the cross stringers are placed two layers of ⅛-in. Masonite, between which are five layers of Minwax, a full-seal waterproof fabric. This Minwax is applied with lapped joints and extends from the belt rail 30 in. above the floor on each side and over the well pans, to a point about 40 in. above the floor at the ends. A heavily-waterproofed pan is thus formed, on the top of which rests the car floor, made of 1¼-in. tongue-and-groove longleaf yellow pine, laid longitudinally of the car and nailed through to the floor stringers.

Two layers of 2½-in. Dry Zero are used as side insulation, the first layer fitting between the posts, and the second, in one piece, covering the posts and forming a complete bond with an equivalent thickness of end insulation held in place by the pressed-steel ends. The side and roof insulation are in one piece, forming a continuous layer 5 in. thick from side sill to side sill. A waterproof protection paper is placed over the insulation before the metal sides are bolted in place.

Outer Steel Shell Made of 3/32-in. Sheets

The rounded roof of the car, made of 3/32-in steel, rests on wood carlines, bolted to the Z-section steel roof trusses. In order to make the car readily repairable, as far as insulation is concerned, the roof, side sheets and pressed-steel ends are flanged and bolted together, being secured to the car only by lines of bolts at the Z-section side sills, end sills and door posts. All safety appliances are applied to the steel shell and are removable with it. Particular attention was paid to eliminating all contacts between the lining and the outside shell of the car so that there would be no frost lines of any kind. The roof

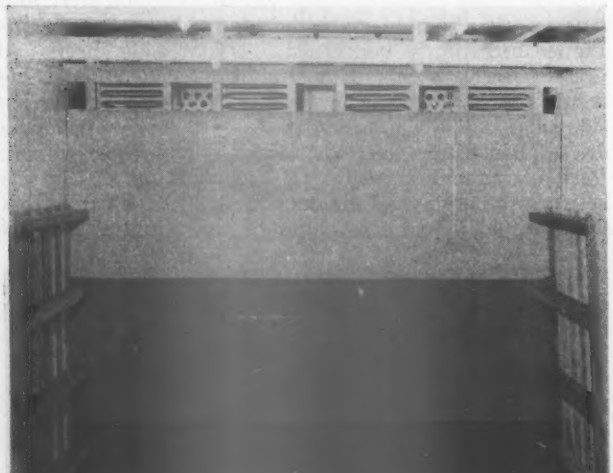
How the double layers of Dry Zero insulation are applied

The fabricated steel underframe and superstructure frame

hatches also are especially designed to give effective insulation. They are made round instead of rectangular, in order to provide a closer fit and minimize the chance of air leakage. Miner door-locking fixtures are applied on the standard 4-ft. by 6-ft. doors.

Bunker Capacity of 1,500 lb. of Crushed Ice

An improved well-pan drain trap is provided in this car. The standard drain trap has a cover over the outlet pipe which is sealed when the drain traps are full of water but, when the traps are not full of water, it is



Interior view showing ice-bunker partition, special well-pan drain trap, floor racks and beef rail in one end of the car

possible for outside air to enter the car and raise the temperature. The type of drain trap used in this car includes a float with a rubber gasket on the bottom to seal the outlet pipe against air leakage when the well traps are dry. The interior of the car is of the standard conventional type. A steel bulkhead, as shown in one of the illustrations, is provided at each end of the car, giving a bunker capacity, per end, of approximately 1,500 lb. of crushed ice. The car is equipped with beef rails and floor racks.

Coil-Elliptic Spring Group for A.R.A. Trucks

A COMPACT form of coil-elliptic spring group, is being offered by the Symington Company, 230 Park avenue, New York, for application to existing A.R.A. trucks. This application does not require any alteration to the bolster, side frames or spring plank.

To meet the limitations of space imposed by the A.R.A. design, the group, as illustrated, is normally

Coil-elliptic spring group for Symington double-truss side frame

composed of a single elliptic spring placed transversely and a pair of coil springs, also disposed transversely, and to one side of the elliptic spring. The lack of symmetry is primarily a matter of appearance, as the center of resistance of the combined group falls reasonably close to the transverse center line of the spring plank. Any small eccentricity is effectively balanced by the diagonal placement of the elliptic spring of one group to that of the elliptic spring on the other side of the truck.

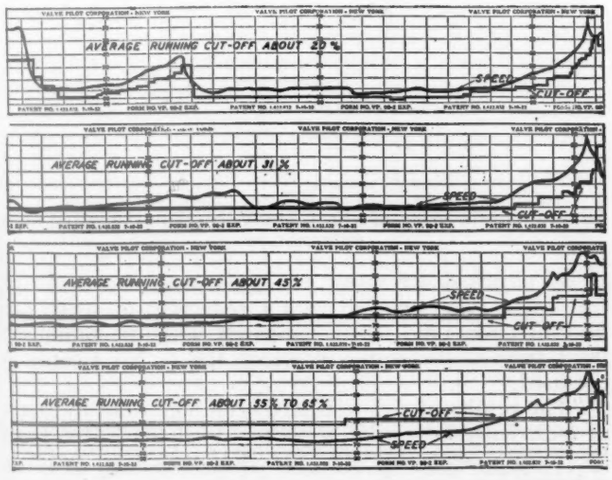
The original and symmetrical form of this spring group comprises a central, transversely extending elliptic spring with two coil springs on either side. It is designed for use with the Symington double-truss side frame which affords a greater area of spring seat.

Coil-elliptic spring group for A.R.A. standard truck side frames

Controlling Coal Consumption

Cincinnati Railway Club paper offers interesting description of method of operation and service results of the Loco Valve Pilot

AT a meeting of the Cincinnati Railway Club at Hotel Gibson, Cincinnati, Ohio, September 13, 1932, John L. Bacon, sales manager of the Valve Pilot Corportation, New York, presented a paper on the operation and performance of the Loco Valve Pilot. In introducing his remarks on the subject, Mr. Bacon cited fuel records on American railroads in both freight and passenger service for the years 1920 to 1931 inclusive, showing that in freight service the average number of lb. of fuel required to move 1,000 tons of freight and cars one mile had been reduced from 197 lb. in 1920 to 137 lb. in 1931, a decrease of 23 per cent. Likewise, in passenger service, the average number of lb. of fuel required to move a passenger-train car one mile has been reduced from 18.8 lb. in 1920 to 14.5 lb. in 1931. Mr. Bacon attributed this excellent showing in fuel economy work to two causes—a comprehensive educational campaign and a noteworthy advance in locomotive design. While reorganizing the advances that have been made in this phase of locomotive operation, he drew attention to the fact that there is still a great waste involved in the utilization of fuel, and that while the generation of steam in locomotives is more efficient, the utilization of the generated steam remains largely a matter

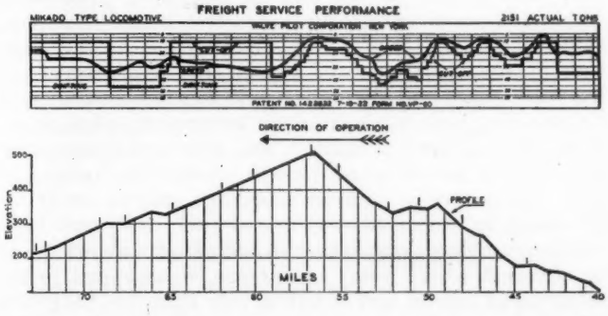


The two upper charts are typical Valve Pilot operations indicating an average running cut-off of about 27 per cent; the two lower charts of operation, without the Valve Pilot, indicate a cut-off of about 50 per cent. The difference in these two operations measured in terms of steam passing through the cylinders, is 57,700 lb., or 184,600 cu. ft. of steam per 100 miles

of unregulated and uncontrolled guesswork because its effective distribution lacks the scientific guidance that has characterized the achievements in the stationary power-plant field.

Mr. Bacon's address dealt briefly with a description of equipment which has been developed to increase the efficiency of steam utilization in locomotives as well as the performance of locomotives equipped with these devices.

He said in part, "It is asked: 'Does not the locomotive engineer know the fundamental characteristics and underlying principles of design and operation, and is he not able to translate them into terms of the procedure necessary to produce the potential capacity of the locomotive?' No, he does not. Neither does the central-station operator, but in his case engineering study, research and experiment have determined the best manipulation to meet various conditions and have designed suitable instruments and apparatus to indicate clearly and definitely to the operator the precise action to be taken to co-ordinate operation with the demand of the



Reproduction of a tape record matched with profile

moment and have thus provided the means of telling him what to do and of recording the fulfillment!

"In like manner the inherent capacity of a locomotive being known, it is a comparatively simple matter to determine from dynamometer car deductions and other calculations just what operation is required to produce all or any part of that capacity as required under varying conditions. Having determined the factor of steam distribution which will develop maximum power, speed, or fuel efficiency, or any combination of them, it follows that it is possible to reproduce those results by a faithful repetition of the operating methods under which the standard was originally established. To co-ordinate such information and express it visually to the engineman is the purpose of the Loco Valve Pilot."

Mr. Bacon described the Loco Valve Pilot at some length. Functionally, it is a combined speed and cut-off indicator and recorder consisting of three units—the speed and cut-off indicating and recording instrument in the cab, the friction speed drive in contact with the tire of a locomotive wheel, and the cut-off-indicating cam mechanism connected to the locomotive reverse shaft. The indicating and recording instrument in the cab has two hands—one a red hand indicating speed and a short black hand indicating cut-off expressed in terms of miles per hour rather than in per cent of cut-off. The recording mechanism, in which a tape moves horizontally across a registration roll, is in the upper part of the instrument. Each movement of the speed or cut-off hand is accompanied by a corresponding movement of the speed or cut-off pencil on the table so that an actual record of operation is kept at all times. When the loco-

motive is at rest, the speed hand is at the low end of the scale, and the pencil is at the top of the tape. As the speed increases, the speed hand moves and the pencil is drawn downward over the recording roll. When the reverse lever is in the corner, the cut-off hand is at the lower end of the speed range on the dial and the cut-off pencil is at the top of the tape. As the cut-off is shortened, the cut-off hand moves around the dial and the cut-off pencil is drawn downward across the tape. The tape moves to the right across the registration roll at the rate of one-half inch per mile of locomotive travel and at every point the pencils record the speed and cut-off, respectively. The graph produced is the resultant of the horizontal motion of the tape and the vertical motion of the pencils.

Engineman Can Make Better Use of Power

Continuing, Mr. Bacon said: "While the Loco Valve Pilot does not interfere with the engineman's method of handling the locomotive, it does furnish indications which will lead him to make vastly better use of the power than he can make when operating the locomotive according to his unaided and all too-fallible judgment. Following Valve Pilot indications duplicates test plant determinations in regular service. This means that by the selection of the proper cut-off to suit the requirements of load and speed the engineman will get between six and ten per cent more work from the locomotive, when maximum tractive force is needed, and when maximum tractive force is not required, he will operate the locomotive with fuel economy. Faster schedules, due to better acceleration and more efficient use of fuel, will result from uniformly correct operation, as compared with what can be obtained where every engineman is unguided in the selection of cut-off and is left to rely upon his judgment alone.

"Loco Valve Pilot control of fuel consumption produces economy far-reaching in its effect on operating costs which is doubly important in periods when, the volume of traffic being low, the fuel bill is relatively high.

"The visible expression of the point of cut-off on the dial of the instrument enables the engineman unerringly and at any time and at any speed to produce from the locomotive its maximum tractive force at any incidental speed, by merely so manipulating the reverse lever as to bring the cut-off hand line-in-line with the speed hand of the instrument. Maximum fuel economy while maintaining any desired speed is produced by merely advancing the cut-off hand (shortening the cut-off) to the point where the speed tends neither to decrease nor increase.

"This remains equally true when the load is so light that the full power of the locomotive cannot be used and the throttle must be partly closed. Under these conditions Loco Valve Pilot indications lead to the most efficient and most economical use of the steam passing through the steam pipes while such limiting conditions exist.

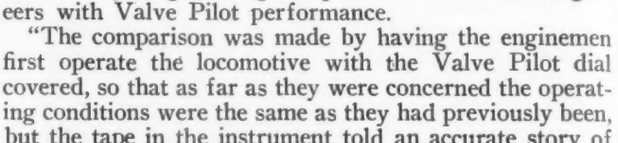
"The difference between locomotive operation with and without the Valve Pilot is the difference between scientific and unscientific use of steam in the cylinders. It is similar in principle to the difference between the product of a mechanic working with fine micrometer tools and that of another mechanic who has to rely on his own judgment when doing precision work.

"The enginemen on all roads do a good job when we consider the tools with which they have to work but the difference between the fuel economy which the average engineman is able to produce in every-day passenger or freight service, when compared with what can be accomplished by the same man when he has the Loco Valve Pilot to guide him in the use of cut-off, is remarkable.

Service Test Results

"In an elaborate road test with a Mikado engine in freight service it was sought to develop the savings which could be obtained by the use of the Loco Valve Pilot when comparing the regular performance of the engineers with Valve Pilot performance.

"The comparison was made by having the enginemen first operate the locomotive with the Valve Pilot dial covered, so that as far as they were concerned the operating conditions were the same as they had previously been, but the tape in the instrument told an accurate story of the way the engine was operated, the speed attained and the cut-off actually used at every point of the run. The cover was then removed and a number of runs were made following Valve Pilot indications. The result was a saving of about eight per cent in fuel per thousand gross adjusted ton-miles *per train hour** and conversely on the basis of work done per unit of fuel burned with and without the use of the Loco Valve Pilot the test demonstrated an increase of 14 per cent per thousand



Diagrammatic view of the Loco Valve Pilot applied to a locomotive

gross adjusted ton-miles *per train hour* in favor of the Valve Pilot, coupled with a reduction of seven per cent in train time when compared with the minimum train time in the series in which the Valve Pilot was not used.

"The results of this test have been borne out by years of experience in regular service. What the Valve Pilot has meant, comparing the year 1927 with later years is indicated by a cumulative net saving on that division of more than $100,000 in 39 months with fuel costing $3.19 per ton on the tender. On roads with higher fuel costs the savings would become more important.

"Such savings in freight service, when applied to the fuel consumed by road engines on any railroad will have a great effect on operating costs and net operating revenue at the end of the year.

"A most interesting study of this subject has recently been conducted in regular passenger service and developed that is was possible, following Valve Pilot indications, to run from A to B, a distance of 588 miles, for coal. In a later run with a similar train in like service, but where the operation was in accordance with the engineman's judgment alone, the same engine was cut out for coal after a run of 257 miles because she had not

* With the valve pilot the average gross adjusted tons were increased 3.5 per cent as compared with the operation without the valve pilot; the average train-hours per trip were reduced 3.1 per cent; total coal fired was reduced 3.1 per cent; gross ton-miles per train-hour increased 5.2 per cent, and coal per thousand gross adjusted ton-miles decreased 5.6 per cent.—Editor.

enough fuel left in the tender to get to the next coal dock 67 miles away.

"Saving in fuel, however, is not measured by the coal scales alone, for time and tonnage enter into the problem.

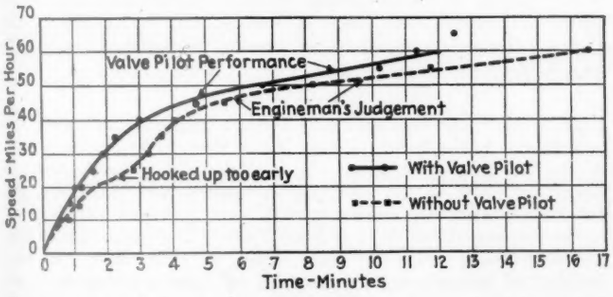
"Viewing the subject from that standpoint it is apparent that if more work is performed per pound of coal burned, then fuel economy has been produced, a result attained when with equal fuel consumption trains of a given tonnage are hauled in less running time, or heavier trains are handled in the same running time. The result in each case is more ton-miles per hour without additional fuel—which spells economy.

"A recent study of Valve Pilot performance showed a 16 per cent reduction in running time coupled with a reduction of coal per thousand gross ton-miles and on another road the Valve Pilot regularly handles heavier trains over the division in less time than lighter trains had theretofore been handled.

"In another divisional analysis in freight service it was shown that with equal fuel burned and somewhat heavier trains the Valve Pilot reduced the running time 24 minutes.

"The savings by the Valve Pilot in this field are due to the fact that with its aid the engineman can unerringly produce maximum tractive force which means better acceleration, getting up to speed faster and better running speed on grades.

"A convincing demonstration of the universal adaptability of the Loco Valve Pilot is found in the record of performance on two different divisions of a heavy tonnage railroad. On one division, with a mountain profile, Valve Pilot operation showed a coal consumption of 161 lb. and an operating cost of 33 cents per 1,000 gross ton-miles against a consumption of 195 lb. and an operating cost of 39 cents per 1,000 gross ton-miles on engines



The acceleration of two identical 11-car express passenger trains. Upper curve, with Valve Pilot, shows speed of 60 m.p.h. was reached 4½ min. sooner than lower curve without Valve Pilot

without the Valve Pilot—a reduction of 34 lb. or 17 per cent and a saving of six cents or 15 per cent per 1,000 gross ton-miles in favor of the Valve Pilot.

"On another division of the same railroad, over a momentum grade profile, the fuel consumption under Valve Pilot guidance was 59 lb. and the operating cost 19.2 cents per 1,000 gross ton-miles and without the Valve Pilot was 81 lb. with an operating cost of 24 cents per 1,000 gross ton-miles—a reduction of 22 lb. or 27 per cent and a saving of 4.8 cents or 20 per cent operating cost per 1,000 gross ton-miles.

"Savings of such magnitude are of themselves impressive and make an important contribution to the direct reduction of operating costs. But when coupled with an appreciable decrease in the time element as evidenced by an increase in the gross ton-miles per hour there is an additional indirect return in the form of quicker deliveries, elimination of overtime, reduction of per diem charges, etc.

"It is interesting to note that this striking performance was accomplished under very strict observance of all speed limitations which, because of the heavy motive power involved, means a further indirect but extremely tangible saving from reduced maintenance-of-way charges due to elimination of rail bending by the abnormal stresses incident to speeds in excess of the safe limit imposed by axle weights. In fact, on another railroad where costly rail damage was known to result from high speeds of a certain class of locomotive the trouble was promptly and permanently stopped by adoption of the Valve Pilot and the consequent making of scheduled running time without resort to excessive speeds.

"The elimination of violations of speed limits actually results in shortening running time because better schedules can always be maintained in train operation when wide variations in speed are avoided and where the most efficient average speed is attained and maintained.

"The Loco Valve Pilot gives precision control in locomotive operation, eliminates former wasteful methods and substitutes highly efficient processes with consequent savings large in amount and of great importance.

"To save steam—to get the most work out of it—is the real problem and locomotive operation will be more efficient in proportion to the steam savings which are made. This is a field which merits the closest study by every railroad and resort should be had to every means to accomplish that result, which, when achieved, will play an important role in lowering operating costs and saving money."

Truck with Graduated Spring Resistance

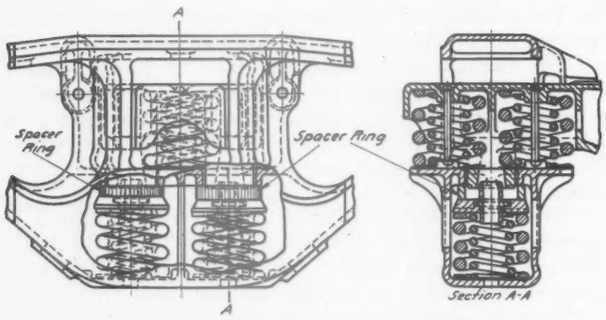
THE National Malleable & Steel Castings Company, Cleveland, Ohio, has embodied several new features into its National Type B truck, such as increased spring capacity, quick wheel change, light weight and oversolid protection of the springs. During the past year a new feature has been added for the purpose of improving still further the riding qualities of the truck. In the Type B trucks for the 40-and 50-ton capacity cars four Class E springs per side frame are used and in the 70-ton size four Class G springs are used. In each design two of the springs are housed within the tension member of the side frame and the other two springs are housed within the bolster end.

The new feature consists in the use of compression rings inserted between the top of each of the lower springs and the top wall of the tension member. These rings hold the two springs under compression. The bolster sleeves do not contact with these springs until the bolster has moved downward a predetermined dis-

The improved National Type B truck

tance. Preferably one ring of each pair is thicker than the other, so that its spring is held under a greater amount of initial compression. The thickness of these rings is such that the car when light or lightly loaded is carried entirely on the two upper springs in the bolster. The car under average load is carried by the two upper springs and one of the lower springs and under full load by all four springs.

A spring carrying a dead load has a definite period of oscillation, the rate of oscillation depending upon the



The spacer rings above the lower springs provide a graduated spring resistance

amount of load and the stiffness of the spring. The National Type B truck, by carrying certain of its springs under initial compression and bringing them into action after a definite amount of bolster movement, is intended to break up this oscillation period and thus to provide smooth riding at all speeds.

This new spring arrangement, by carrying the light car on two springs per side frame, a medium load on three springs and a full load on four springs, produces a graduated spring resistance or a progressive spring capacity which automatically adjusts itself to the load being carried.

Power Reverse Gear Has Poppet Exhaust Valves

THE Type M-1 power reverse gear, recently placed on the market by the Barco Manufacturing Company, Chicago, is designed to incorporate several new features that make for simplicity, fewer operating parts, dependability, and lower cost of maintenance. The new gear is particularly adapted for use on switching and transfer locomotives, but is also recommended for road locomotives where a cushion-type balanced gear is preferred.

An entirely new design of operating valve is used in this gear, providing a small rotary valve for admission of air to either end of the cylinder and providing a separate poppet-type valve for exhausting the air from each end of the cylinder.

The combination of the rotary and the poppet valves provides accurate adjustment and maintains the point to cut-off closely, due to the sensitivity of the poppet exhaust valve, which may be easily adjusted without removing any part from the reverse gear or locomotive. The valve is so designed that the operating lever or mechanism may be used on either the inside of the cylinder next to the boiler or on the outside of the cylinder away from the boiler, whichever provides the best reach-rod connection to the quadrant lever.

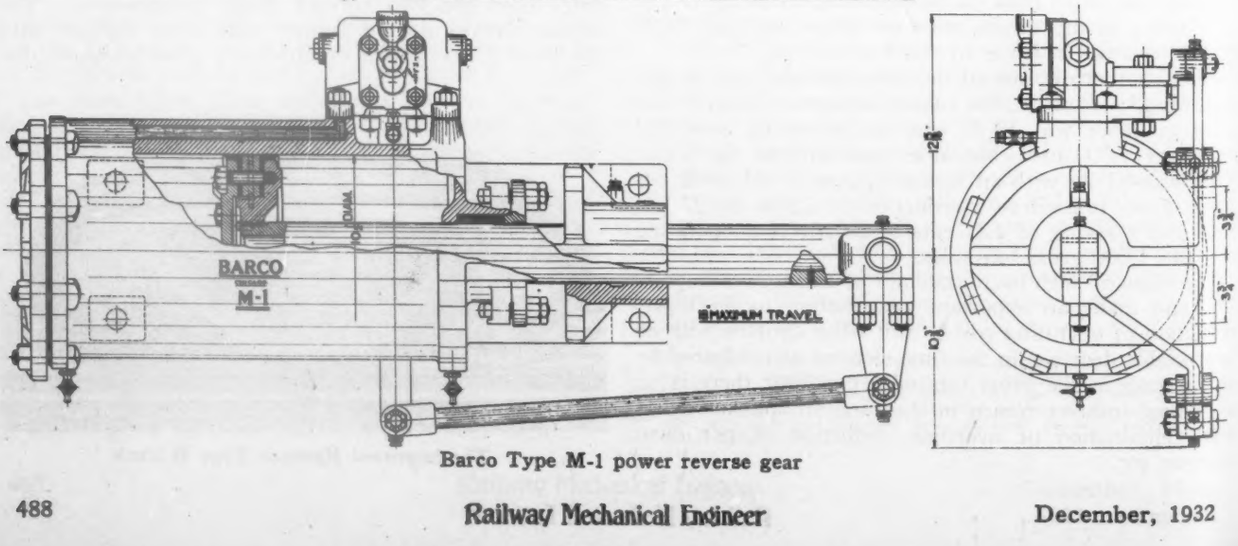
The piston is of the conventional cup-packing type. The cylinders are 10½ in. in diameter instead of the usual 10 in., giving the gear considerably more power to move the modern heavy locomotive valve gear.

Another entirely new feature, not previously used in power reverse gears, is incorporated by providing a 6-in. piston-rod bearing, cast integral with the cylinder, in front of the piston-rod packing, thus giving the piston-rod the proper support without the expense of maintaining guides and crossheads. This arrangement relieves all strain on the piston-rod packing.

A hollow piston-rod is provided with a tell-tale hole so that any leakage past the cup packing may be readily detected.

This gear is entirely different from the Barco Type B-4 gear, as it is a cushion gear held in position by balanced pressures, whereas the B-4 gear is a positive-lock gear, not held in position by balanced air pressures. The Barco Manufacturing Company expects to continue to furnish the Type B-4 gear, the Type M-1 gear being offered to those who prefer a cushion-type balanced gear.

NOTHING SLOW ABOUT THESE YALE MEN—The engine forces of the St. Louis-San Francisco at Yale, Tenn., made quite a record recently in the handling of engine No. 1525, of the 4-8-2 type, when the driving wheels were removed, preparatory to the turning of the tires, in 3 hr. 5 min. The engine came into the roundhouse under its own steam at 11:35 a.m. It was stripped of its rods and the last pair of driving wheels was set on the ground at 4 p.m. The record was made by a machinist, a helper on the outside work and three helpers in the pit, two of them inexperienced. They were egged on by E. F. Tuck, general foreman, and S. M. Ferguson, back shop foreman, in person.



Barco Type M-1 power reverse gear

Rigid Versus Flexible Machine Design

By R. C. Pierce*

Machine parts are flexible without regard to the designer's ideas—It is easier to design machines by taking advantage of all the known properties of the material used than to assume conditions which do not exist

ENGINEERS are prone to regard machines as combinations of rigid elements operating without deflection. This is illustrated by the care with which engines and compressors are lined up necessarily while stationary and not under load. The average engineer is quite satisfied if he has lined up a machine under such conditions and is often surprised that such a machine does not operate with satisfaction.

An interesting investigation of high-pressure air compressors a number of years ago brought out some very self-evident facts which at the time appeared to be startling. A chain of manufacturing plants equipped with the same type of high-pressure air compressor showed varying results as to the interval between repacking of the high-pressure rods. This time varied between five days and five months, with most of the plants operating for periods of not over ten days to two weeks between shut-downs for repacking.

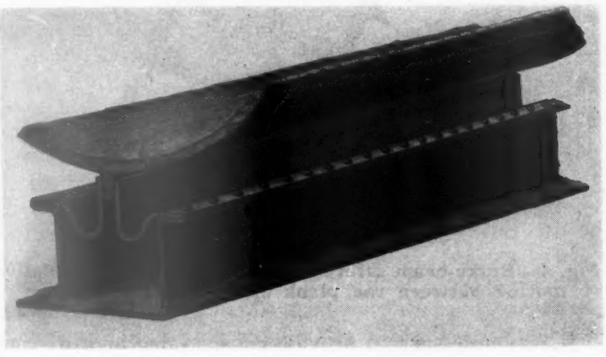


Fig. 1—Flexible anchor construction for tank cars

Compensating for Flexible Compressor Frames

A careful study of these machines showed that the compressors operating the longest time was decidedly out of line, while many of the compressors operating for the shortest time were lined up accurately. Deflection measurements showed that the best operating compressor was in line while operating. The poorly operating compressors, while in line without load, were out of line when in operation.

Two solutions suggested themselves. One was an increase in section of the compressor frames to reduce deflections. A compressor was actually built having frame stresses as low as 125 lb. per sq. in. This compressor operated with satisfaction, but the cost of the heavy cast-steel frame was prohibitive.

The other solution was to use the comparatively light frames and make the compressor rods self-alining by the use of a modified ball and socket connection. These self-alining rods were cheap to make and gave results superior to the rigid rods in the compressor with the heavy frame.

Flexible Tank-Car Anchors

A study of the average tank-car design shows that designers have approached this problem with the idea that the underframes and tanks are rigid. The usual tank-car anchor is a rigid connection between the bottom of the tank and the top of the center sill. Theoretically, the loads of the tank and lading are supposed to be taken down through the slabbing to the bolsters of the car. Actually, due to tank deflections, a considerable portion of the load is taken to the center of the center sill. These center sills are of the uniform section type and are not supposed to take vertical forces. A flexible anchor construction which is capable of transferring to the center sills the horizontal buffing forces and yet which has sufficient flexibility to prevent the application of vertical force, is shown in Fig. 1.

This anchor is unusual in that the depending vertical fin is integral with the tank itself. Tanks for high-pressure cars are generally made of low-carbon steel with the various portions forge-welded together. The anchor fin is part of a T-section and, by welding the two top edges of the section into the tank, a one-piece construction is obtained, eliminating the use of rivets through the tank shell. This is especially important when shipping hazardous materials such as chlorine, sulphur dioxide and ammonia.

The use of curved anchor plates permits the utmost

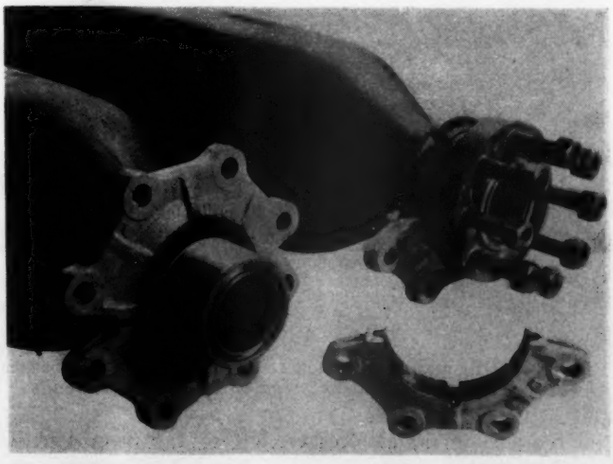


Fig. 2—Helium tank with ball and socket anchor attachment

* Vice-president, charge of engineering, General American Tank Car Company, Chicago.

of flexibility in the anchor and allows relative motion between the tank and the center sill, preventing the imposition of undue vertical forces on a center sill not designed for such service.

This is a solution of a problem and represents the first real improvement in tank-car anchor construction since the invention of the center anchor.

Flexible Construction in Helium Cars

The special tank anchorage used on the helium car is an illustration of another form of flexible anchor construction. Fig. 2 shows a tank end with ball-and-socket anchor feature. The swaged down end of the helium tank is threaded and is provided with a shrunk-on threaded ring formed to a spherical contour with a center projecting ring. This ring is for the purpose of holding the tank should improper adjustment of the spherical surfaces result in excessive end motion.

These helium tanks operate under a working pressure as high as 2,350 lb. per sq. in. and are made of heat-treated alloy steels. It is easy to calculate the stresses in the tank due to gas pressure and weight of the tank. It would be quite impossible to calculate the stresses which might be imposed by a twisting of the car superstructure. The advantages of a flexible anchorage are obvious, and the practical results obtained have proved the soundness of this design.

Solution of Broken Spring-Planks

The freight-car spring plank, which serves to connect the truck side frames together, is subjected to severe tortional stresses as the truck sides move up and down as they pass the rail joints. Trouble with spring planks has steadily increased, and there has been a constant effort to overcome broken planks by increasing the strength of the planks.

It is obvious that a spring plank cannot be made strong enough to prevent relative motion between the truck sides, and even if this could be done such a truck would very likely be easily derailed.

Fig. 3 shows the latest spring plank which has been designed to afford equal strength with the old spring plank as far as horizontal and vertical forces are concerned, but which develops only 60 per cent of the tortional stresses for any angular movement between the spring-plank ends.

This spring plank weighs no more and costs the same as the standard A.R.A. spring plank and, because of

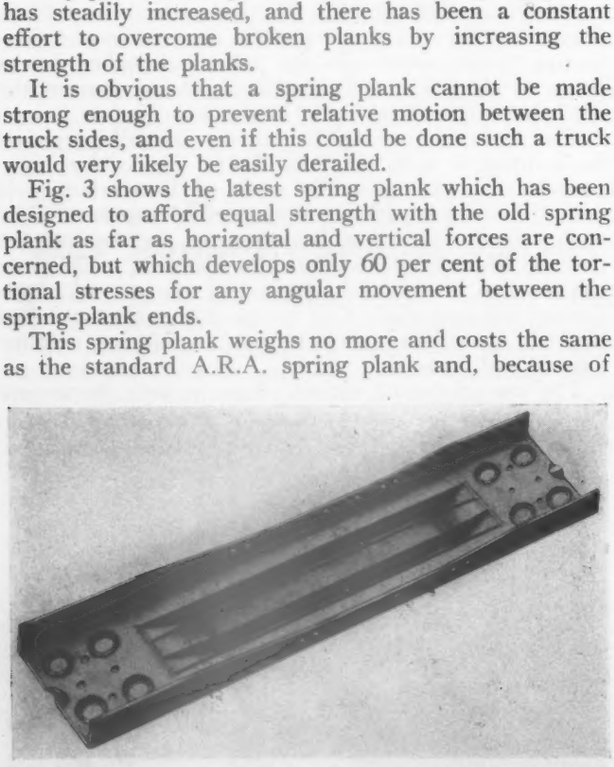


Fig. 3—Spring plank designed to reduce tortional stresses for angular movement between the spring-plank ends

the reduced tortional stresses, has so far proved to be 100 per cent in service. This certainly illustrates the fact that flexible design is desirable in cases where it is impossible to be assured of rigidity of structure.

Brake-Beam Safety Supports which Stay On

Because of the severe twisting which is received by all spring planks, trouble has always been experienced in holding on brake-beam safety angles by means of vertical rivets through the web of the spring plank. No matter how large rivets are made, they become loose and the safety angles drop off.

Fig. 4 shows a brake-beam safety support which allows relative motion between the spring plank and the safety-support bar. A clip is riveted on each side of the spring plank. The clip rivets are in shear and, therefore, working to the best advantage. A notched bar engages the slots in the clip and the bar is held in place by two formed springs driven in between the bottom of the spring plank and the top of the bar. The safety support bar is easily removable without any tools, except a hammer, and no amount of weaving of the spring plank will loosen the bar or springs.

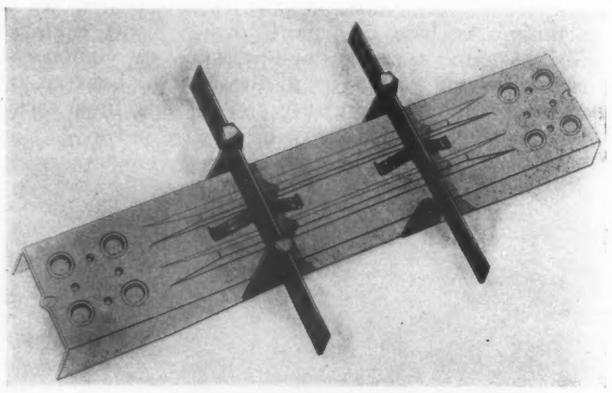


Fig. 4—Brake-beam safety support which permits relative motion between the plank and safety-support bar

It was necessary to provide considerable area of contact between the bar and the clips to prevent rapid wear. This wear is evidence of the constant motion between the parts, but once sufficient area was provided freedom of motion of the parts without undue wear was possible.

Freight-car trucks should be extremely flexible, both vertically and horizontally. The use of lateral motion devices, friction snubbing and flexible spring planks, permits easy car riding and, without doubt, reduces wheel wear.

Machine designers can well afford to give more consideration to flexible design. Machine parts are flexible without regard to the designer's ideas and certainly it is easier to design machines taking advantage of the actualities of the situation rather than to assume conditions which do not exist.

A Safety Record.—The tank car repair department of the Mid-Continent Petroleum Corporation, Tulsa, Okla., has made quite a safety record, one which they are ready and even eager to stack up against the safety record of any railway car department. The company operates 2,189 tank cars. With 57 men employed in the tank car repair department, not one of them has lost time on account of an injury since January 28, 1930. The number of man-hours worked since that time has aggregated 335,846. In this industry, lost time on account of an injury means time lost after the day in which the man has been injured, which is somewhat diferent from the ordinary railroad practice. The 57 men in the car repair department make all kinds of light and heavy repairs to steel tank cars, including steel shell work, coupler and draft gear repairs and renewals, frame work, axle and wheel work, running board repairs and renewals, air brake work, painting and general maintenance and upkeep of all kinds.

Multi-Pressure Locomotive On the Canadian-Pacific

Part II

FOLLOWING are abstracts of the papers presented by J. B. Ennis, vice-president, American Locomotive Company, and by H. B. Bowen, chief of motive power and rolling stock, Canadian Pacific, at the spring meeting of the American Society of Mechanical Engineers, which was held at Bigwin, Ont., June 27 to July 1, 1932, inclusive. Part I of this report contained an abstract of the paper by F. A. Schaff, president, Superheater Company. These three papers composed a symposium sponsored by the Railroad Division on the design and performance of the Canadian Pacific multi-pressure locomotive No. 8000.

Paper by Mr. Ennis

In the development of the multi-pressure locomotive it was the intention from the start to deviate as little as possible from the conventional lines of locomotive design and to use as many parts of the Canadian Pacific Class T-1 locomotive as practicable. This locomotive, built by the Montreal Locomotive Works in 1929, is the most powerful freight locomotive of the Canadian Pacific. Its total weight is 370,000 lb., its weight on drivers is 312,800 lb., and its tractive force 77,200 lb. without the booster. The multi-pressure locomotive was supposed to be not less, and if possible more, powerful than the Class T-1, without increasing the number of wheels. Therefore, the requirement to adhere, in general, to the design of the Class T-1 locomotive was natural.

In two major respects, however, novel features had to be introduced: in the locomotive engine and in the structural connection of the boiler and locomotive chassis.

Regarding the locomotive engine, it was estimated that 63,000 lb. of steam would be furnished, of which approximately 56 to 47.6 per cent would be high-pressure steam of 850 lb. pressure, and the remainder of 250 lb. pressure. Both high- and low-pressure steam were supposed to be superheated. It was expected that the total temperature of the first would be between 600 deg. and 800 deg. F., while the total low-pressure steam temperature would fluctuate between 550 deg. and 725 deg. F., depending on the rate of firing.

Abstracts of two papers presented at the Bigwin meeting of the A. S. M. E. describing the machinery, chassis and tender and reporting on the operation and maintenance of the C. P. R. multi-pressure locomotive No. 8000

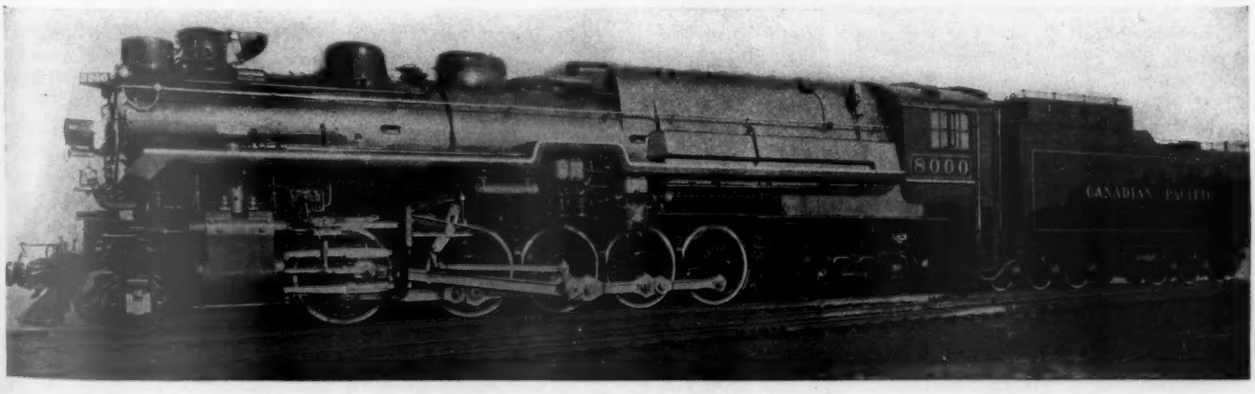
To utilize the heat contained in the steam in the most efficient manner, it is necessary to use double-expansion for the high-pressure steam. The most practical combination of the two-stage expansion with one-stage expansion of the low-pressure steam generated separately, is the one applied in the Schmidt-Henschel Locomotive of the German State Railways[1], namely, the mixing of the exhaust from the first stage of the high-pressure expansion with the low-pressure live and superheated steam, using this mixture for the second stage of the expansion. By doing so, the necessity of interstage heating for the high-pressure is eliminated, resulting in simplification of the locomotive.

It is obvious that more than two cylinders are necessary for this scheme. The cross-compound system is not possible in view of the excessive size of the single low-pressure cylinder for a locomotive with 320,000 lb. weight on the drivers. Either three or four cylinders are necessary, and then several cylinder arrangements could be considered:

1—A tandem compound arrangement, having the advantage of the outside location of all four cylinders without the disadvantage of a crank axle. The drawback, however, being heavy reciprocating parts, resulting in poor balancing, the inaccessibility of piston-rod packings between the cylinders, and the undesirable lengthening of the front part of the locomotive, with ensuing increase in weight.

2—A four-cylinder compound arrangement as used in the high-pressure locomotive of the French Paris-Lyons-Mediterranean Railway. This would require a two-crank axle, which, in

[1] Articles describing the construction and tests of the Schmidt-Henschel locomotive have been published in the *Railway Mechanical Engineer* issues of December, 1928, page 670; January, 1927, page 5; August, 1927, page 531, and August, 1928, page 440. This locomotive, which is a 4-6-0 type, was built by Henschel & Son, Cassel, Germany.



Left side of the Canadian Pacific locomotive No. 8000 equipped with the Elesco boiler

view of the power of the locomotive, it would be impossible to construct in the limited space between the frames.

3—A three-cylinder arrangement with a single crank axle as used in the Schmidt-Henschel locomotive, with a middle high-pressure and two outside low-pressure cylinders.

4—A three-cylinder arrangement differing from the foregoing by making one inside low-pressure cylinder between the frames and two outside high-pressure cylinders. This would also require too large a cylinder, which it would be impossible to place inside the frames.

Thus, of all the four arrangements, the most practical seemed to be the third. Although this necessitated the use of a crank axle, it was thought that as the power on the middle pin is less than in the three-cylinder 4-12-2 type Union Pacific locomotive[2], a satisfactory three-cylinder arrangement could be worked out.

Power Distribution

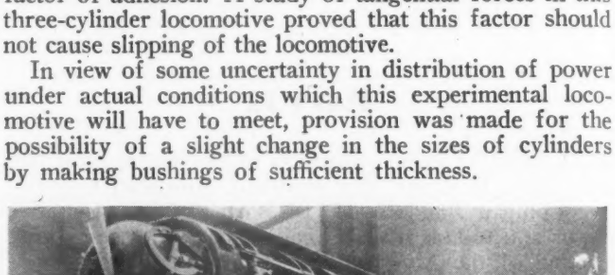
Having decided on this, the next question was the distribution of power. The most natural thing to do would be to divide the power equally between the cylinders. It was not so much the division of tractive force at starting, as the proper division of power under running conditions, as the overall efficiency would be more affected by the latter than by the former. On the other hand, it was rather desired to get slightly less tractive force from the middle cylinder so as to protect the middle main pin.

The three-cylinder arrangement with two working pressures offers a very convenient means for equalizing power without exceeding stresses in the middle pin, by introducing a longer cutoff in the middle cylinder. By doing so, the size of the cylinder can be made smaller and thus the piston thrust in the middle cylinder can be kept within limits. However, this would mean either introducing a complication in the valve gear, or using an independent valve motion for the middle cylinder, whereas from the start it was agreed to use the Gresley valve motion, as in the majority of three-cylinder locomotives built in this country. In view of this, it was decided to make the cutoffs in all three cylinders equal by using the Gresley gear, and to compromise between division of power at starting and under running conditions in such a way as to keep the diameter of the middle cylinder as small as possible.

A study of indicator cards for different cutoffs and various cylinder sizes was made, in connection with service conditions and boiler capacities, and it was found that the ratio of volume of the two low-pressure cylinders to that of the high pressure cylinder should be 5.4. This determined the following dimensions for the cylinders: 15½ in. diameter and 28-in. stroke for the middle high-pressure cylinder, and 24 in. diameter and 30-in. stroke for the two outside cylinders.

On the basis of 850 and 250 lb. pressure in the two boilers, the diameter of driving wheels was made 63 in. 85 per cent coefficient in the tractive force formula, and making allowance for the areas of the high-pressure piston rod and piston-rod extension, the tractive force was estimated to be 83,300 lb., corresponding to 3.84 factor of adhesion. A study of tangential forces in this three-cylinder locomotive proved that this factor should not cause slipping of the locomotive.

In view of some uncertainty in distribution of power under actual conditions which this experimental locomotive will have to meet, provision was made for the possibility of a slight change in the sizes of cylinders by making bushings of sufficient thickness.



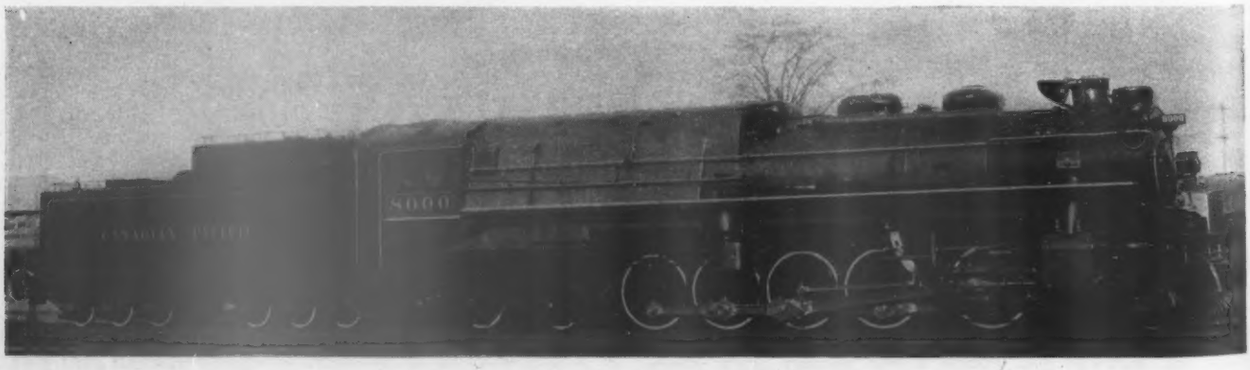
Special framing and air-tight casing used in the construction of the firebox

The middle cylinder is of the same type as used on ordinary three-cylinder locomotives, with the cylinder barrel, steam chest and boiler saddle cast in one piece. In this case, the front bumper and bumper bracket are cast integral with the cylinder. Special precaution has been taken to make the bolting of the cylinder as rigid as possible.

Design of the System of Steam Distribution

The cylinder is made of cast steel to a special specification, with a silicon content of .40 per cent and manganese .82 per cent. The cylinder barrel is inclined at an angle of 8 deg. 31 min. to the horizontal to permit the middle main rod to clear the front driving axle, the second being the crank axle. The cylinder bushing is made of high grade cast iron, of a composition insuring good wearing qualities. The steam chest is horizontal, as the case usually is in three-cylinder locomotives with Gresley valve motion, and has two high grade cast-iron bushings for the high pressure 6-in.

2 See the July, 1926, issue of the *Railway Mechanical Engineer*, page 419.



Right side of the multi-pressure locomotive

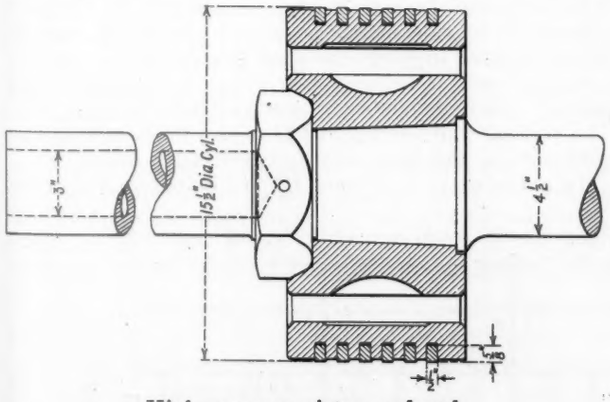
piston valve. Steam is admitted between the piston-valve heads (inside steam admission) through a 4½-in. steam pipe. The exhaust is directed through two 5-in. openings, one on each side of the cylinder, into the two mixing chambers, where it meets the low-pressure superheated steam and whence it is further directed into the two low-pressure cylinders.

The exhausts from the outside cylinders have to pass through the middle cylinder into the exhaust pipe and nozzle. A rectangular 5½-in. by 10-in. opening is provided on each side of the middle cylinder in the fitting surface. To insure tightness between the middle and outside cylinders, special copper wire interwoven asbestos gaskets are used. Provision is made for passing the booster exhaust through a specially made passage in the saddle into the exhaust pipe, in case of future application of a booster. The openings for the booster pipe connections are, for the present, blocked off by welded-in plates.

High- and low-pressure cylinder heads and steam-chest covers are made of cast steel, except the front low-pressure steam-chest covers, which are of cast iron. They are secured to the cylinder by chrome-nickel studs.

The high-pressure piston, in view of its comparatively small size, is of the solid-head type. It is made of cast iron to special specification. The width of the piston is 8 in. and there are six snap packing rings of cast iron, ½ in. wide and ⅝ in. thick. Experience with the German high-pressure locomotives had shown that for proper packing of high-pressure steam, a large number of narrow rings is necessary.

It is common practice in America to omit the extension piston rods, as this is not needed for proper guiding of the piston. While this omission would be also possible in the high-pressure cylinder, it was thought, however, that for better equalization of pressures on both sides of the piston, it would be more advisable to have the



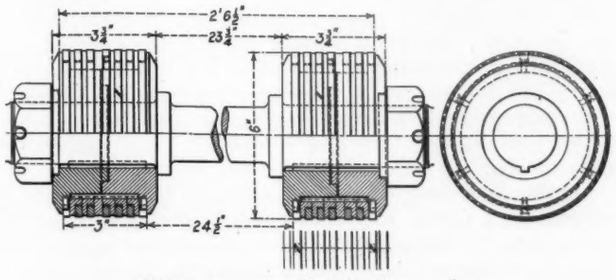
High-pressure piston and rod

piston rod extended in front of the piston with the same outside dimension as in the back portion, 4½ in. The front extension has a hollow boring of 3 in. in diameter to save weight. The piston rod is forged of medium carbon steel. It is comparatively short, having a length of 66½ in., counting from the middle of the piston fit to the center of the crosshead wrist pin. The crosshead is of the common single-guide, three-bar type (Dean design), made of cast steel, with a long cast-steel shoe.

Pistons for the outside cylinders are of the regular Z type, made of cast steel, have no extension rods, and are connected to alligator type crossheads. Each piston has a cast iron bull ring 6 in. wide with two narrow ⅜-in. by ¾-in. cast-iron snap packing rings.

The original high-pressure piston-rod packings were of special German design as used in the Schmidt-Henschel locomotive of the Reichsbahn. In principle it is the standard German packing used on regular locomotives, differing from that only in the number of rings, six being used instead of three for each stuffing box. It was found necessary to replace this packing by that of the King type.

Out of a number of middle main rods tried on three-



High-pressure distribution valve

cylinder locomotives in America, a light and simple rod was chosen. The body of the rod is integral with the lower portion of the strap, the upper being bolted to the rod by one 2¾-in. bolt in the front, and three 1¾-in. bolts in the back. A floating bushing, made of bronze in three pieces, fits the 12-in. middle pin of the crank axle with small radial and side clearances between the crank-axle cheeks. The crosshead end of the middle main rod has adjustable bronze bearings.

The outside main rods connected to the third, which is the main axle, and all side rods, are of the regular C. P. R. design, the low-pressure main rod having adjustable bronze bearings at the front end and floating bushings at the back end revolving in a stationary solid steel bushing. The side rods have floating bronze bushings in stationary cast-iron bushings on the main and intermediate pins, and solid bronze bushings on the front and back pins.

All main and side rods are of I section and are made of nickel steel.

The high-pressure steam valve is of the plug type, having two heads, each made of two halves, with six cast-iron bull rings and seven narrow cast-iron snap packing rings, all assembled on a common forged-steel valve stem with an extension. The low-pressure valve is of the common spool type, assembled on a valve stem with extension.

The valve-stem packings, both for the high- and low-pressure valves, are of the King type, which is standard on the C. P. R. The high-pressure valve-stem packing has no contact with high-pressure steam in view of the valve being of the inside admission type.

The valve gear for the outside cylinders is of the Walschaert type and gives 7½-in. valve travel. The valve motion for the inside cylinder is derived from the two outside gears by the combined Gresley valve motion frequently used on three-cylinder locomotives in America. The Gresley levers have ball bearings in the main fulcrum and in the connection between the two levers. As stated above, the travel and cutoffs are the same in all cylinders. The reverse is of the screw type, which is standard on the Canadian Pacific. No power reverse is used.

Boiler Framing

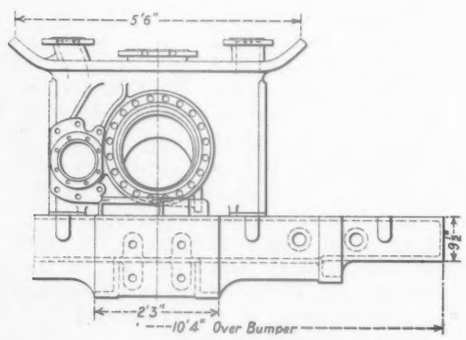
In the multi-pressure locomotive the low-pressure boiler is in principle of the same design as the conventional boiler. The high-pressure boiler in itself, however, does not offer sufficient rigidity to the locomotive structure. It was, therefore, necessary to enclose the

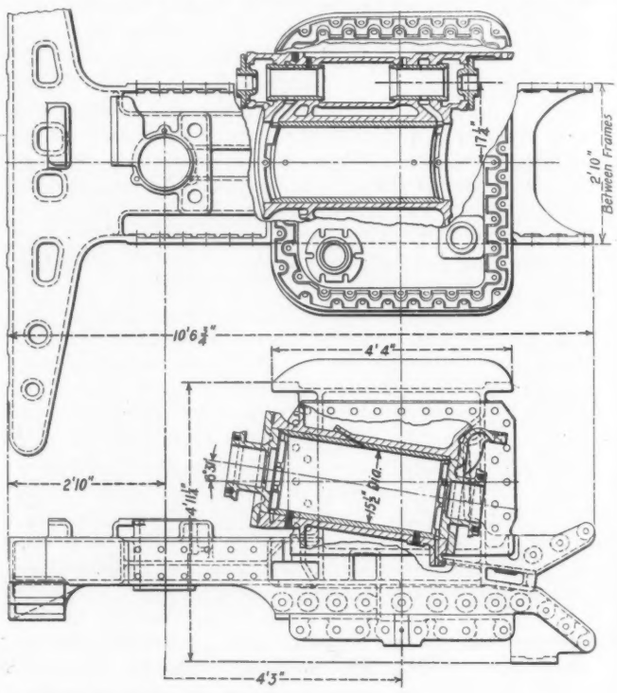
firebox and the combustion chamber in a special framing which would form a rigid connection between the boiler and locomotive frame.

Moreover, a water-tube firebox requires an air-tight casing which will not permit outside air to enter the firebox, except the air which is admitted for proper combustion through the ash pan.

These two aims have been attained in the following ways: Support *A*, referring to one of the drawings, with semi-circular brackets for the high-pressure boiler and separator drums, is riveted to the rear portion of the low-pressure boiler. The drums are kept in position by rigidly bolted caps. The rear part of the drums, with support *D* bolted to them, can freely slide on the upper part of the structure. Shoes *N* and rollers *O* are provided for this purpose.

On the underside of the low-pressure boiler, opposite support *A*, a saddle *E* is bolted, which is also suspended by tie rods *F*. Supports for the high-pressure pump and air compressor are built integral with the boiler saddle.





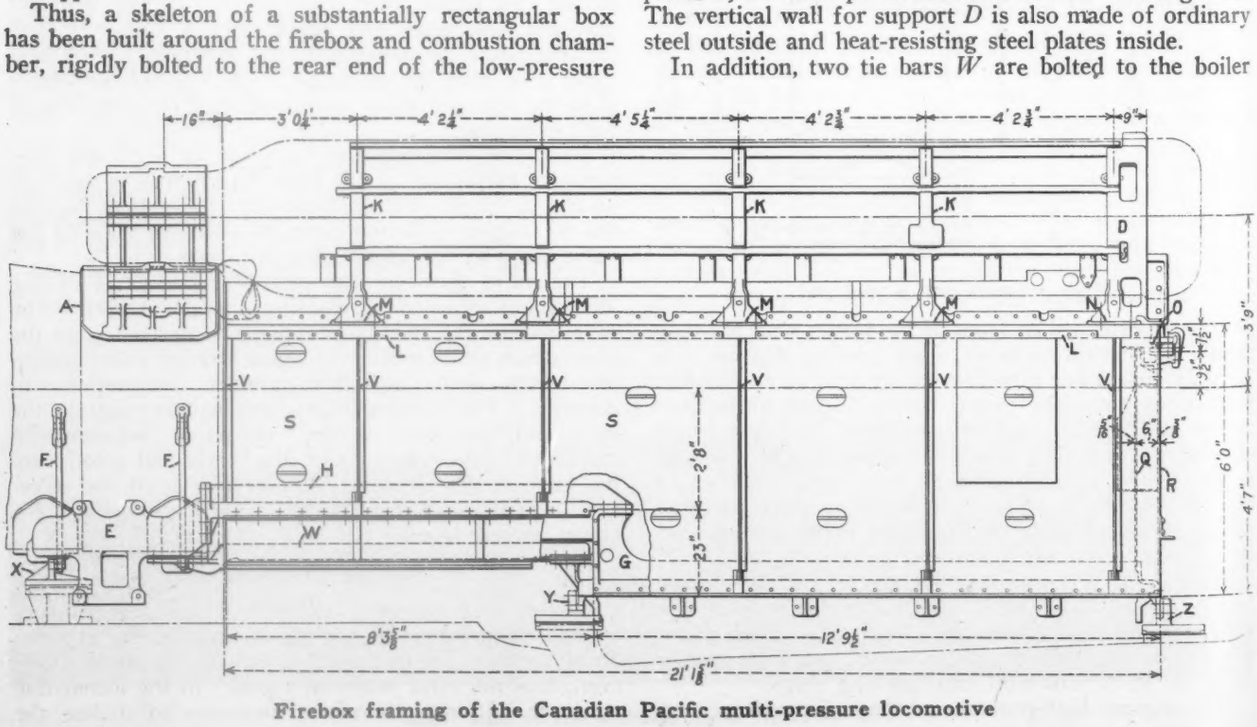
High-pressure cylinders with bumper and bumper bracket

The firebox ring is surrounded by a rectangular casting *G*, called the foundation ring, which is connected with saddle *E* by two side support members *H*, one on each side of the firebox. The rear end of the foundation ring has a built-up vertical wall for the slides *N* and rollers *O* of support *D*.

Thus, a skeleton of a substantially rectangular box has been built around the firebox and combustion chamber, rigidly bolted to the rear end of the low-pressure boiler. The whole box is supported by the frame and can freely slide on it, permitting the boiler as a whole to expand longitudinally.

The following parts complete the box: Eight castings *K*, four on each side, are bolted to the high-pressure drum and embrace the separator drums. They can freely slide on two support members *L*, one on each side of the firebox, with slide plates *M* in between. The side supports *L* are further connected by vertical columns *V* to side members *H* and foundation ring *G*. Between these supports, on each side of the locomotive, a vertical wall is built of two rows of removable steel plates *S*, the inner plates are made of heat-resisting steel. The vertical wall for support *D* is also made of ordinary steel outside and heat-resisting steel plates inside.

In addition, two tie bars *W* are bolted to the boiler



Firebox framing of the Canadian Pacific multi-pressure locomotive

saddle *E* and foundation ring *G*. Three expansion slides permit this structure to expand along the frame; one slide *X* is bolted to the boiler saddle *E;* another slide *Y* is bolted to the front lug, while the third slide *Z* is attached to the rear lug of the foundation ring *G*.

The above structure, needed for carrying the weight of the high-pressure boiler, for permitting its expansion and for imparting sufficient rigidity to the boiler as a whole, is further completed by several plates to make it air-tight. Plates of heat-resisting steel are placed underneath the high-pressure and separator drums and tied by angles between themselves and the inner plates. Heat-resisting plates and ordinary steel plates are bolted to members *H* and tie bars *W* finish the encasing of the firebox.

The high-pressure and separator drums are insulated by high-temperature lagging as well as approximately half of the space between heat-resisting inner plates and plates *Q* and steel plates *S* and *R*, next to the heat-resisting plates, is filled with the same lagging. The low-pressure boiler is lagged with magnesia blocks and jacketed in the ordinary manner.

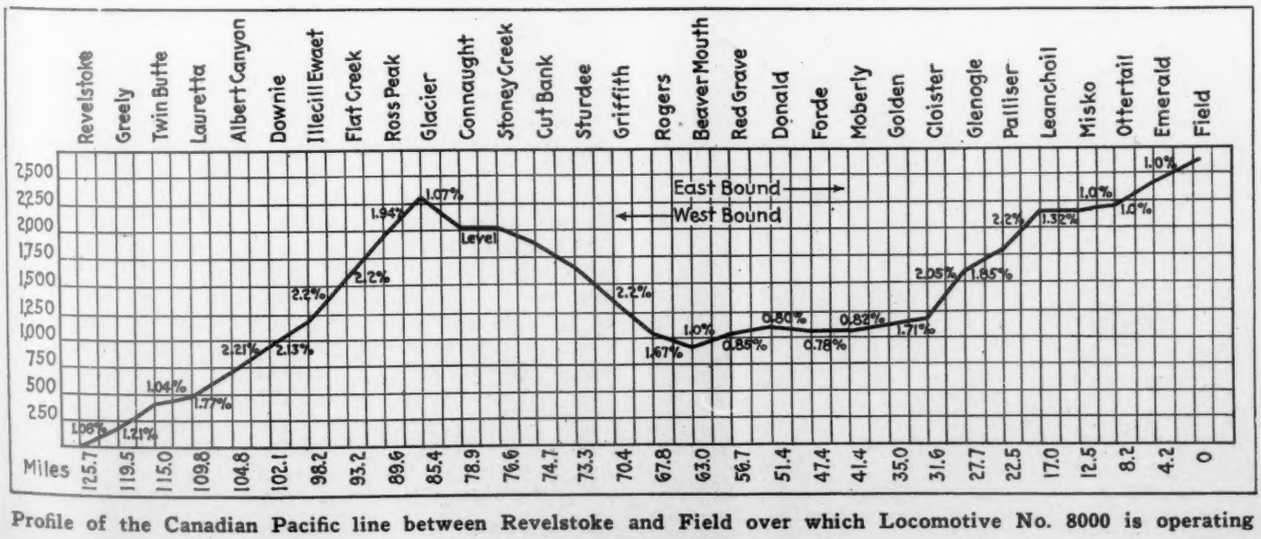
Chassis and Running Gear of the C. P. R. Locomotive

The general design of the locomotive chassis, including the frames, wheels, brake rigging, etc. is very similar to that of the Canadian Pacific 2-10-4 locomotive, Class T-1, except of the parts which were affected by the difference in the type of boiler and machinery. As a matter of fact, a great number of parts and the tender as a whole are practically identical. The locomotive frame, however, for this experimental engine was not a locomotive bed as in the T-1 class, but of the built-up type, consisting of two frames (right and left) 6½-in. thick, made of nickel cast steel.

The locomotive is designed to negotiate 18-deg. curves. For this purpose the front axle has the Alco lateral-motion device, with a play of 1 in. on each side. The front engine truck is of the Commonwealth two-wheel,

Performance Record T4 and T1 Class Locomotives

				T4-a-avg.	per cent Improvement T4-a over T1,	T1-a-avg.	T1-a 5907	T1-a 5905	T1-a 5905
Class	T4-a	T4-a	T4-a						
Locomotive No.	8000	8000	8000						
Beavermouth to Glacier (Westbound) 22.5 Miles									
Date	4-23-32	4-15-32	6-22-32	.....	.....	.....	4-26-32	4-28-32	.....
No. of cars, total	37	44	16	.....	.....	.....	20	17	.....
Weight of train, equiv. gross tons	1,029	1,060	1,103	1,064	.....	1,069.5	1,046	1,093	.....
Equiv. gross ton-miles	23,152	23,850	24,818	23,940	.....	24,063	23,535	24,592	.....
Lb. of oil, total	3,374.8	4,399.8	4,689.9	4,154.7	.....	4,878.4	5,144.4	4,612.5	.....
Lb. of oil used per 1,000 equiv. g.t.m.	146.0	184.8	188.9	173.2	14.9	203.5	218.8	188.2	.....
Lb. of oil used per locomotive mile	149.9	195.5	208.4	184.6	.....	216.8	228.6	205.0	.....
Lb. of water, total	47,850	47,130	49,150	48,040	.....	49,885	47,840	51,930	.....
Lb. of water used per lb. of oil	14.2	10.7	10.47	10.79	5.3	10.25	9.3	11.2	.....
Total time on road	1 hr.16 min.	1 hr. 45 min.	1 hr. 47 min.	1 hr. 36 min.	.....	1 hr. 24 min.	1 hr. 18 min.	1 hr. 31 min.	.....
No. of stops	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total time delayed	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ruling grade and curve	2.2 per cent, 10 deg.	2.2 per cent, 10 deg.	2.2 per cent, 10 deg.	.....	.....	.....	2.2 per cent, 10 deg.	2.2 per cent, 10 deg.	.....
Albert Canyon to Glacier (Eastbound) 19.4 Miles									
Date	4-30-32	6-15-32	6-23-32	.....	.....	.....	4-25-32	4-27-32	4-29-32
No. of cars, total	49	37	41	.....	.....	.....	44	45	44
Weight of train, equiv. gross tons	1,088	1,076	1,108	1,090.6	.....	1,053	1,058	1,051	1,052
Equiv. gross ton-miles	21,107	20,874	21,495	21,158.6	.....	20,441	20,525	20,389	20,408
Lb. of oil, total	4,583.5	4,960.7	4,951	4,831.7	.....	5,467	5,424.8	5,753.6	5,192.7
Lb. of oil used per 1,000 equiv. g.t.m.	217.1	237.6	230.3	228.3	14.7	267	264.6	283.4	254
Lb. of oil used per locomotive-mile	236.2	255.7	255.2	249	.....	281.2	279.5	296.5	267.6
Lb. of water, total	54,460	49,150	54,070	52,560	.....	54,040	50,570	53,270	58,270
Lb. of water used per lb. of oil	11.88	9.9	10.92	10.9	10.1	9.9	9.3	9.2	11.2
Total time on road	1 hr. 52 min.	1 hr. 19 min.	1 hr. 48 min.	1 hr. 40 min.	.....	1 hr.33 min.	1 hr. 23 min.	1 hr. 51 min.	1 hr. 26 min.
No. of stops	2	.....	1	1	.....	2	2	1	3
Total time delayed	29 min.	.....	20 min.	16 min.	.....	2 min.	2 min.	1 min.	2 min.
Ruling grade and curve	2.2 per cent, 10 deg.	2.2 per cent, 10 deg.	2.2 per cent, 10 deg.	.....	.....	.....	2.2 per cent, 10 deg.	2.2 per cent, 10 deg.	2.2 per cent, 10 deg.



Profile of the Canadian Pacific line between Revelstoke and Field over which Locomotive No. 8000 is operating

cast-steel, outside-bearing type with 7¼-in. lateral movement, while the trailing truck is of the four-wheel, cast-steel, Commonwealth type, with 10¼-in. lateral displacement necessary for 18-deg. curves.

Following the example of the German State Railway locomotive, the cranks were spaced at approximately 120 deg. for the sake of torque uniformity. As it was expected, this crank setting resulted in an uneven exhaust sound. The engine being of the compound type and having only four exhausts per revolution, sounds "lame" at low speeds, but at speeds above 15 miles per hour, the nonuniformity of the exhaust vanishes.

The crank setting is, of course, corrected for the inclination of the middle cylinder and for the difference in strokes of the high and low-pressure cylinders. For the middle crank it is 129 deg. 12 min. with the left-hand crank, and 110 deg. 48 min. with the right-hand crank, the right being the leading. The angle between the two outside cranks is exactly 120 deg.

The counterbalances for the reciprocating weights are distributed evenly between all driving wheels except the main. The total percentage of counterbalancing of the locomotive, figured by the static method, is 34.75 per cent.

All driving and trailer-truck wheels of the locomotive have brakes operated by a Westinghouse automatic brake equipment, with 8½-in. cross-compound air compressor. The driving wheel brakes are divided in two sections, the front section operating the three front axles from two 14-in. by 10-in. cylinders, while the back portion operates the two rear pair of drivers from two 12-in. by 10-in. cylinders. The trailer truck has a separate brake applied to all wheels, using two 8-in. by 12-in. cylinders. Three main reservoirs are used on the locomotive, with a total capacity of approximately 80,000 cu. in.

All steam auxiliaries are operated by low pressure, except the two high-pressure pumps which are operated by high-pressure steam. There are two cab turrets, one for superheated and one for saturated steam. The first has connections to the high- and low-pressure feed pump, the air compressor, the blower, the oil-burner operating valves, the mechanical-lubricator heating coil, the headlight dynamo and the whistle. The second turret has valves to the steam-heat line and to the injector.

Principal Dimensions, Weights and Proportions of the Canadian Pacific Multi-Pressure Locomotive and the Power with which Its Performance Is Being Compared

Railroad	Canadian Pacific	
Builder	Co. shops*	Montreal
Type of locomotive	2-10-4	2-10-4
Road Class	T4a	T1a
Road number	8000	5000
Service	Experimental	Freight
Cylinders, diameter and stroke	H.P.—15½ in. by 28 in. L.P.—24 in. by 30 in.	25½ in. by 32 in.
Valve gear, type	Walschaert-Gresley	Walschaert
Valves, piston type, size	H.P.— 6 in. L.P.—12 in.	14 in.
Maximum travel	7½ in.	7 in.
Outside lap	1⅜ in.	1⅛ in.
Exhaust clearance	H.P.— 0 in. L.P.—⅛ in.	⅛ in.
Lead in full gear	3/16 in.	3/16 in.
Cut-off, per cent	85	86
Weights in working order:		
On drivers	320,500 lb.	312,800 lb.
On front truck	55,500 lb.	37,000 lb.
On trailing truck, front	54,400 lb.	47,400 lb.
On trailing truck, back	64,800 lb.	55,300 lb.
On trailing truck, total	119,200 lb.	102,700 lb.
Total engine	495,700 lb.	452,500 lb.
Tender	300,000 lb.	300,000 lb.
Total engine and tender	795,200 lb.	752,500 lb.
Wheel bases:		
Driving	23 ft. 6 in.	22 ft. 0 in.
Total engine	47 ft. 6½ in.	46 ft. ½ in.
Total engine and tender	88 ft. 0 in.	87 ft. ¾ in.
Wheels, diam. outside tires:		
Driving	63 in.	63 in.
On front truck	33 in.	33 in.
Trailing truck, front	36¾ in.	36¾ in.
Trailing truck, rear	45 in.	45 in.
Journals, diam. and length:		
Driving, main	12 in. by 14 in.	12½ in. by 14 in.
Driving, others	11½ in. by 14 in.	11½ in. by 14 in.
Front truck	7 in. by 14 in.	6 in. by 11 in.
Trailing truck, front	7 in. by 14 in.	7 in. by 14 in.
Trailing truck, rear	8 in. by 14 in.	8 in. by 14 in.
Boiler:		
Type	Elesco	Conical
Steam pressure	H.P.—850 lb. L.P.—250 lb.	275 lb.
Fuel, kind	Oil	Oil
Diam., first ring, inside	82 in.	82½ in.
Firebox, length and width	129⅜ in. by 85¾ in.	140 3/16 in. by 96 in.
Comb. chamber, length	109 in.	60 in.
Tubes, number and diam.	.....	59—2¼ in.
Flues, number and diam.	214—3½ in.	203—3½ in.
Length over tube sheets	19 ft. 1⅛ in.	20 ft. 6 in.
Grate area	77 sq. ft.	93.5 sq. ft.
Heating surfaces:		
Cl. circuit, firebox tubes	520 sq. ft.	.....
Firebox and comb. chmbr.	.....	377 sq. ft.
H.P. boiler, transfer coils	750 sq. ft.	.....
Arch tubes	.....	45 sq. ft.
Tubes and flues	3,730 sq. ft.	4,506 sq. ft.
L.P. boiler tube sheet	16 sq. ft.	.....
Total evaporative	4,816 sq. ft.	4,928 sq. ft.
Superheating	H.P.— 935 sq. ft. L.P.—1,168 sq. ft.	2,112 sq. ft.
Comb. evaporative and super-heating	6,919 sq. ft.	7,040 sq. ft.
Tender:		
Water capacity	11,500 gal. (Imp.)	11,500 gal. (Imp.)
Fuel capacity	4,100 gal. (Imp.)	4,100 gal. (Imp.)
Wheels, diam. outside tires	36¾ in.	36¾ in.
Journals, diam. and length	6 in. by 11 in.	6 in. by 11 in.
General data, estimated:		
Rated tractive force	83,300 lb.	77,200 lb.
Rated tractive force, booster	.....	12,000 lb.
Comb. tractive force, starting	.....	89,200 lb.
Weight proportions:		
Weight on drivers ÷ total weight engine, per cent	64.5	69.2
Weight on drivers ÷ tractive force	3.83	4.05
Total weight engine ÷ comb. heat. surface	71.5	64.3
Boiler proportions:		
Tractive force × diam. drivers comb. heat s'rf'ce	758	692
Firebox heat. surface ÷ grate area	6.97	4.52
Firebox heat. surface, per cent, evap. heat. s'rf'ce	11.14	8.56
Superheat. surface, per cent evap.heat. surface	43.8	42.8
Comb. heat. surface ÷ grate area	89.8	75.2

* Built in co-operation with the Superheater Company and American Locomotive Company.

The Tender

The tender is of the standard Canadian Pacific type and in all respects identical with that used for the Canadian Pacific 2-10-4, two-cylinder, class T-1 engine. The frame is of the cast-steel Commonwealth water-bottom integral type with six-wheel Commonwealth trucks. The tank is of the rectangular type, having a water capacity of 11,500 Imperial gal. (13,800 U. S. gal.) and a maximum oil capacity of 4,100 Imperial gal. (4,925 U. S. gal.). The tender tank has a recess in which the low pressure feed water heater pump is located.

Lubrication

The following locomotive parts are lubricated by oil from a 14-feed mechanical lubricator; middle and outside crosshead shoes through the corresponding guides, the middle guide delivering oil also to the wrist pin and front end of the middle main rod; high- and low-pressure steam chests and cylinders; right hand high-pressure and low-pressure feed pumps and air compressor, and high-pressure piston-rod packings. The left-hand high-pressure feed pump is served by a hydrostatic lubricator.

All driving boxes, including those of the crank axle, have regular cellars with perforated plates for grease lubrication. Engine and tender-truck boxes are lubricated by oil and waste. Outside main rods, middle main rod and side rods have hard grease lubrication from Alemite type cups. The remainder of the locomotive and tender parts, such as the valve motion, driving- and truck-box pedestals and hub faces, all the engine- and tender-truck center plates, engine center pin, lateral-motion device, radial buffer between locomotive and tender, etc., have soft grease lubrication.

Aside from the high pressure feature, the locomotive

does not differ from the conventional engines. The aim was to introduce no more novelties than was absolutely necessary, to retain the general appearance of an ordinary locomotive and make possible the use of the methods of operation of the steam locomotive to which generations of railroad men have become accustomed.

Mr. Bowen's Paper on Operation and Maintenance

Multi-pressure locomotive No. 8000 is the joint production of the Superheater Company, the American Locomotive Company and the Canadian Pacific, who are, respectively, responsible for the high-pressure steam generating system, the three-cylinder arrangement, valve motion and the general locomotive proportions, and the design and construction, which was done at our Angus shops, Montreal, Que. It was turned out for operation in July, 1931, and during the ensuing few months the engine was used in freight service between Montreal and Smith Falls, Ont., to determine its operating characteristics and, particularly, to develop the arrangement of oil burners which it was anticipated would have to be somewhat different from the standard burner arrangement used on our western lines.

Construction was commenced in November, 1930. The machinery, together with the low-pressure boiler and firebox framework, was erected in a complete unit, while the closed system and high-pressure boiler were assembled on a jig especially constructed for this purpose in the boiler shop. Work on these separate units progressed simultaneously and on April 10, 1931, the closed system and high-pressure unit being completed, were subjected to a hydrostatic test, each being found tight under the required test pressure. On April 13 the closed circuit and high-pressure unit were released from the jig and transferred to the machinery and low-pressure boiler unit. With the addition of cab, fixtures, fittings and piping, the engine was ready for steam test.

Various features show excellent examples of how metallurgical developments have permitted constructions that would not have been possible with the materials of construction available only a few years ago. Stainless steels for valves and valve seats have surmounted the limitations of bronze and the corrosion defects of ordinary steels. Stainless-steel plates have provided a direct baffle for the oil flame to prevent the flame coming in direct contact with the drums. These plates, while resistant to high temperatures, have given some trouble on account of expansion, which necessitated some changes in clearance. Low-carbon nickel steel for seamless drum construction has permitted high factors of safety with reduced weight. Nickel-steel boiler plate in the low-pressure boiler has also given the requisite strength with approximately 30 per cent reduction in weight. Nickel-steel forgings have provided toughness and resistance to abuse and impact with minimum weight in various driving and motion parts.

It is customary on the Canadian Pacific to operate locomotives by the pool system. Naturally, it is desirable to make the operation of all locomotives as simple and as uniform as possible. This was kept in mind in all controls for locomotive No. 8000, and in spite of there being two superheaters and two throttles for the high- and low-pressure cylinders, the throttle mechanism was worked out so that only one throttle lever is used for opening both throttles.

The operation is identical with that of an ordinary locomotive. The low-pressure boiler is fed with a standard Elesco CF-1 feed pump and is provided with a Hancock inspirator as an auxiliary. Incidentally, the CF-1 pump for the low pressure boiler is located within a compartment provided in the tender tank; a location that we had previously tried out with considerable success and advantage. The high-pressure boiler is pumped with a specially designed CF-1 boiler feed pump adapted to high-pressure service. A duplicate of this pump is also provided as a standby and auxiliary in connection with feeding the high-pressure boiler. The high-pressure water pumps are located one on either side of the boiler.

The cut-off control in the valve motion is a straight duplicate of that of an ordinary locomotive. The oil-burner control is also identical and the only deviation is the two varying water levels for the high- and low-pressure boilers, respectively, and the two boiler-feed pumps for feeding these two boilers. The cross-over valve is an addition and there are other features that require periodic checks by the engineman, but these have all been so simplified that it has not constituted any objection from the standpoint of simplicity of operation. In fact, after the initial period the locomotive was turned into the regular pool and is now handled by any engineman who may be assigned to it on any individual run. There has been keen interest on the part of the enginemen and a desire to be assigned to locomotive No. 8000.

Operating Over 2.2 Per Cent Grades

The most difficult operating problem on the Canadian Pacific is the movement of both freight and passenger traffic over the Mountain sub-division in British Columbia. Numerous heavy grades are encountered, the worst of which is 22.5 continuous miles of almost uniform 2.2 per cent grade.

In 1929, 20 new locomotives were put in service on this sub-division, of the 2-10-4 wheel arrangement, using 275 lb. boiler pressure and two simple cylinders. These locomotives immediately introduced new standards of economy and performance, and by no means the easiest problem was selected when the Canadian Pacific decided to construct for direct comparison a multi-pressure locomotive of substantially the same weight, wheel arrangement and proportions as the T-1 class engines now handling traffic on this sub-division.

Locomotive No. 8000 burns oil as fuel and the proportions of the flash pan, size, number and location of oil burners constituted a real problem, as there was practically no precedent on which to base the design. When the locomotive was originally turned out, several experiments were made with location of a single burner and a double burner, and after a considerable amount of experimenting, proper locations for two burners were decided upon, one of which amply provides for ordinary demands with the second one being cut in when required by abnormal conditions.

It will be appreciated just how difficult this problem was when it is understood that three separate boilers—the closed system, the high-pressure boiler and the low-pressure boiler—are all supported by the one firebox and combination of burners, and that a balance in the heat distribution must be maintained between these three heat-absorbing units through a wide range in steam demands of the locomotive.

This has been partially offset by introducing a by-pass valve from the high-pressure to the low-pressure boiler so that excess steam can be by-passed without losing it through the safety valves. Even as yet this by-pass arrangement is used to some extent, but, of course, the ideal solution to be accomplished is the final adjustment and balance of component features of oper-

ation so as to obviate the necessity of any by-passing.

This can, of course, only be accomplished by close observation and adjustment of the locomotive in operation until the final proportions and adjustments are definitely determined. Originally, the cross-over valve gave trouble in that it caused severe disturbances of the water due to by-passing the high-pressure steam, which was overcome by a change in design of the valve outlet into the low-pressure boiler.

Proper draft adjustments and boiler conditions are somewhat more difficult to secure with locomotive No. 8000 as the exhausts are secured at uneven intervals. The uneven effects of the exhaust on the draft conditions of the engine are more noticeable at low speeds. This has been greatly improved with better combustion and increased superheat temperatures by installing baffle plates in the smokebox with apertures to more evenly diffuse the draft, a change in stack diameter and changes in the exhaust nozzle. While great improvements have been effected, the problem is so different from an ordinary locomotive that still further improvements can be expected.

At the present time there is no doubt as to the increased maintenance cost of the multi-pressure engine over that of the conventional simple locomotives operating over the same division. This is generally true of locomotives radically different in design and construction, as the shop men lack experience on this type of locomotive and must become acquainted with the various details which are different from those on the locomotives they have been maintaining. Many experimental changes are also continually in progress at present which are apt to be mistaken for regular maintenance. Boiler men, not acquainted with the new boilers, require more time to wash out the two systems than they will when thoroughly acquainted with this work.

The safety valves presented a difficult problem in that their dimensions were strictly limited and that they must operate under conditions of vibration and exposure not met with in stationary practice. The valves originally applied were not altogether successful. The valves on the closed circuit system gave trouble largely on account of the actual details of construction which has been overcome by rebuilding the valves in the railway shops by the use of a new form of seat and valve. The high-pressure safety valves also required a change in form of construction, but at present it appears that these difficulties are largely eliminated.

The check valves in the water-delivery line to the high-pressure boiler gave trouble on account of the very high concentrated load in the valve being almost impossible to maintain it in a tight condition for any length of time due to the pounding it received. The solution was a twin check valve with the proper capacity provided by two valves side by side in the same body, so that the total load on each valve of reduced diameter was little greater than the load on the single valve used in conventional practice.

Although over one year has elapsed since the locomotive was first put into service, the breaking in period on Eastern lines, its transfer in knocked-down condition and re-assembly on the Western lines and the various adjustments required while the locomotive was in regular operation on its assigned location on the mountain subdivision has not made it possible to give a complete summary of the operating performance of the locomotive over the entire period since the locomotive was built. The engine performance has been closely followed by observers and results show that a fuel saving of 14.8 per cent has been effected on this division under regular service conditions at slow speeds on 2.2 per cent grades between Albert Canyon, B. C., and Glacier, B. C., eastbound and Beavermouth, B. C., and Glacier westbound. Tests conducted on the Eastern lines over the level Winchester sub-division between Montreal and Smith Falls showed fuel economies of 25 per cent under higher speed and heavy tonnage.

One Hundred Years Ago This Month

Brief synopses of or quotations from articles and news items selected from the American Railroad Journal

December 1, 1832.—An illustrated article in this issue of the *Journal* describes an English patent granted to George Forrester, civil engineer, for certain improvements in wheels for carriages and machinery. Mr. Forrester's patent, which was granted September 5, 1831, is a pattern for molding cast-iron wheel centers which could be combined with wrought or malleable iron. The pattern, which is molded in sand, is provided with grooves for the rim, spokes and hubs through which the molten iron flows.

December 8, 1832.—Two articles are published in this issue which discuss the comparative advantages of heating by hot water, hot air and steam. One of the articles is the report of a discussion on this subject at a meeting of the Institution of Civil Engineers (England). The other article is illustrated and describes experiments in heating by hot water which were made by M. Saul of Lancaster, England.

December 15, 1832.—The editor had the pleasure of examining at the machine shop of Mr. Bruen a new locomotive steam engine constructed for the Lexington & Ohio Railroad. The editor reported: "As it is the first that we ever saw, we cannot speak of its merits, in comparison with those now in use on the railroads of England and the United States; but we learn from those better acquainted with these matters, that Mr. Bruen has invented several valuable improvements in the form and machinery of the engine, together with its appurtenances, which it is thought will be of great service in the application of steam power to railroads. The engine is lighter by about two-thirds than those of the same power now in use on the eastern railroads; the workmanship cannot well be surpassed; and we look forward with impatience for its completion, and the testing of its powers by experiment."

December 22, 1832.—"TRIAL OF A LOCOMOTIVE ENGINE. On Friday last, 14th inst., Mr. Cooper's locomotive, for burning *Anthracite* coal, was placed for trial on the Baltimore and Ohio Railroad. The time expended in running to the mills, &c., was as follows: About half way encountered a train of cars, and run back a mile and a half, making *three* miles, which added to the distance to the mills 13¾ miles, is 16¾ miles. This distance was performed in one hour and twelve minutes. Weight carried on four baggage cars, without friction wheels, inclusive of cars, 18 tons. The road was in bad order from the mud thrown on the rails by the horses attached to the other cars on the road. No coal was put into the furnace after starting, until the engine arrived at the mills.

"It is proper to remark, that the driving wheels occasionally slipped on the rails, from the bad state of the road.

"To convey an idea of the force of the blast, and the intensity of the fire, it is only necessary to state, that the flame was driven out of the top of the smoke stack to that degree as to ignite the hydrogen of the exhausted steam."

EDITORIALS

The 1932 Index

An index of the articles appearing in the 1932 issues of the Railway Mechanical Engineer will be printed and available for distribution shortly after the first of the year. It is available to all of our subscribers who wish to have it. It adds materially to the value of the contents of the year's issues by making it easy to locate material on any subject long after one's recollection of specific articles or the issues in which they were printed has become blurred by time. A file of indexes will make quickly available to you articles in old issues which may not have been of particular interest to you at the time they were published, but which under a change of responsibility of new conditions may prove of real service to you. If you have been receiving a copy of the index in past years, you need take no further action; you will automatically receive a copy of this year's index. If you have not been receiving the index, but would like to have it in the future, drop us a line and your name will be placed on the list of subscribers who are regularly receiving the index each year.

Help the Unfortunate

Times of stress and adversity tend to segregate the courageous from the timid, the sympathetic from the hard-hearted, and the generous from the selfish. Many mechanical-department supervisors and employees have been working during the past two years on short time or not at all. This has meant real suffering on the part of these unfortunate men and their dependents. It is, indeed, a tragedy that a man who is willing and glad to work, and who has devoted years of his life to becoming expert in some line of railroad-shop activity, finds himself out of a job and nowhere to sell his skill.

The railroads have responded to this need in a fine way by organizing agencies for the relief of employees in distress. The many relief departments organized to meet the conditions peculiar to their individual needs have been performing a splendid work and under real difficulties.

However, contributions in the line of money, food and clothing have been gradually decreasing, notwithstanding the fact that the need has been becoming more acute. Some of the organizations formed to help and to collect for the relief work have lost their enthusiasm because of the long, arduous grind. The burden is being carried, in many instances, by only a few persevering persons who keenly appreciate the real need of such service.

It is true that mistakes have been made. Perhaps those in authority have failed in the exercise of true leadership. Nevertheless, the circumstances which have caused this depression are as much the fault of all of us, as individuals, as they are the fault of governments and corporations. By endeavoring to escape our responsibilities we merely prolong the difficulties we are now in. Everyone must do his part.

If you are one of those who have an income, even if what you have is less now than it was last winter, give to those that have less or have nothing. Find out how your local relief department is getting along. Doubtless you will learn that it needs your help. Turn in and do your share—and a little more than your share.

Cleaning Cars For Grain Loading

At the October meeting of the Northwest Car Men's Association, referred to elsewhere in this issue, an admirable paper was presented, covering the details of work which must be done to condition freight cars for grain loading, and particularly the handling of flour. Considerable time was devoted to discussing the problems of maintenance practices, condensation prevention and car cleaning by washing, versus blowing out with air. In view of the wide differences of opinion expressed, it is evident that condensation on metal roofs in cold weather is still giving trouble and that the problem of satisfactorily cleaning cars for grain loading has not yet been entirely solved.

In connection with cleaning methods, advocates of washing maintain that this is the only reliable means of removing certain kinds of dirt and stains from car interiors, and it cannot be questioned that the best modern washing methods effect a marked improvement in the condition of cars and give them a very clean appearance on the inside. Those who believe in blowing or air cleaning, however, maintain that the washing method results in a considerable amount of dust and dirt being simply washed into the cracks; that the water has a tendency to rot or swell the floor boards and inside lining, and that, even worse, the grain weevils, which are now such a prolific source of damage to lading, with attendant claim payments, are left undisturbed. As one member said: "When you wash a car, you simply give the bugs a drink." A still further disadvantage of washing cars, particularly in Northern climates during the winter season, is the difficulty with freezing and the practical impossibility of drying cars after they are washed. Under such conditions, air cleaning appears to be preferable.

One of the objections to air cleaning is, of course, the dust and dirt filled atmosphere which the car cleaners must breathe while using this method. One member said that, because of objections to the blowing process from a health standpoint, the road he represents washes cars most of the time, air blowing them only in the winter when they cannot be washed. Various types of protective hoods and respirators are used by the car cleaners when blowing cars, but, apparently, no protective device has yet been developed which is entirely satisfactory for this purpose. Moreover, it is questionable if even the blowing process is successful in removing all grain weevils from the cracks and crevices in car interiors. The loss and damage occasioned by these insects is assuming increasing proportions, and it appears that some form of insecticide must be introduced into whatever cleaning process is finally selected as the most generally economical and satisfactory method of cleaning cars intended for the loading of grain and grain products.

A New Era Brings New Responsibilities

Elsewhere in this issue appears a description of a 10-ton, four-wheel refrigerator car which has recently been built by the North American Car Corporation. This car has a much greater significance than the interest which will be aroused by a type of construction so unusual in America. It is a striking reflection of a change in emphasis in the railway industry which marks the close of an old and the beginning of a new epoch in railway freight transportation. The old epoch has been one in which the outstanding accomplishments of the railroads have been in the field of operating practices and economies which have brought the railroads to a high state of efficiency as mass transportation machines. The new era is one in which the major emphasis will be placed on the development of facilities and methods of operation to meet the desires of the public as to the kind of service they want and the way in which they wish it to be rendered.

The past decade has been a period of transition in which refinements in operating practices that have decreased lost motion have greatly improved the quality of the service without major changes in its essential characteristics. The new era will be one in which the problems of management will be solved less by skill in the administration of the established system than by ingenuity in adapting railway equipment, facilities and operating practice to the improvement of the commercial efficiency of the entire process of distribution. The successful solution of these problems implies a constant increase in flexibility involving the freight classification and rate structure, types of rolling stock and methods of operation.

The effect of the refinements in operating practice brought about by the railroads during the past decade in increasing the commercial efficiency of distribution has been a frequent subject of comment for a number of years and is generally understood today. The tremendous reduction in inventories and working capital effected by expedited deliveries, however, is only the beginning. The possibilities for reducing the size of commercial units in the shipment of merchandise which have thus been opened up cannot fully be realized without this change of emphasis from the development of ideal operating practices to the development of an ideal service to meet a wide variety of commercial and industrial conditions.

The 10-ton refrigerator car is an experimental effort to meet the new conditions in one field. Whether or not this specific unit achieves the full measure of success anticipated by its sponsors, it typifies a departure from precedent which must become more and more a characteristic of the new era if the railroads are to continue to be a live part of our industrial structure.

The responsibilities of mechanical-department officers are bound to grow as the new trend develops. Their present highly specialized departmental responsibilities pertaining to the design and maintenance of motive power and rolling stock of conventional types, with particular attention to the wide range of problems pertaining to interchange, will continue. But superimposed on these will be new problems which must be approached from a viewpoint much wider than that of the department itself. The development of the necessary flexibility of service requires the closest co-ordination of the knowledge and effort of traffic, operating and mechanical departments. Mechanical-department officers must be prepared to adapt their own methods and ideas to the broader problem of getting and holding traffic. Whatever may be the effect of new types of equipment or the demands for improvements in old types to provide better service, decisions must be based not alone on the relations of these changes to maintenance costs and methods, but on their relation to the railway business as a whole.

Painting Progress

The following well-deserved tribute to the railroad painter is quoted from an editorial in the September issue of the Illinois Central Magazine: "In overalls daubed with the evidence of his trade, but dignified in the knowledge that he toils for useful purpose, the painter performs his task for all to see. . . . The even stroke of his brush or the wet breath of his spray spreads a thin but resistent armor against the siege of time.

"In the practical laboratory of his shop, the painter has studied the chemistry of paint. As an apprentice he learned the basic colors and the shades of paint by the mixture of pigments. He has experimented with the proportion of ingredients. He knows the smooth penetration of oil, the anchoring and binding strength of lead, the drying effects of turpentine, the gums and resins that impart the gloss to varnish, the stain that emphasizes the grain in wood to give expression to nature's artistry. . . . The painter is a symbol of progress and preservation."

Many and complicated are the problems which confront the modern master painter of railroad car and locomotive equipment. Not the least of these problems is the adoption of the proper painting materials and methods to secure desired results at the least cost. This involves a receptive attitude toward new developments, coupled with a conservative application of these developments until such time as their merits are demonstrated. Since time is such an important factor in tests of painting practices, painters cannot, from the very nature of their business, adopt new and untried methods without the possibility that, some months or years later, they may be shown to have made serious and costly mistakes in judgment. The average railroad painter is inherently cautious and probably needs to be warned more against overconservatism than against overprogressiveness in the adoption of new ideas.

There is no question that equipment-painting practices have been revolutionized in recent years. The master painter of today can still provide whatever kind of finish the management of his railroad is willing to pay for, but, generally speaking, the "piano finish" formerly applied to passenger equipment exteriors, for example, is no longer desirable or required. Neither is it permissible, nor good railroading, to hold passenger cars out of service in the paint shop anywhere from 14 to 30 days, or perhaps more, while applying multitudinous paint and varnish coats, all carefully dried and rubbed down to a satiny finish. Great improvements have been made in the manufacture of quick-drying varnishes, enamels and lacquers, the application of which permits making substantial reductions in shopping time to seven days, or less, with resultant large economies. The actual labor cost of application of paint materials has also been largely reduced by the use of the spray method, and with no attendant fire hazard or danger of ill-effects on the human system when shops are provided with adequate ventilating hoods, and the men use proper protective goggles and respiratory devices.

In the field of freight equipment, spray painting has come into general use, with attendant large savings in labor cost of application. Here, again, the employment of quick-drying freight-car paint has also been effective in reducing the time that cars must be held at shop. For example, during days when the weather conditions are not conducive to rapid drying, freight cars frequently are held outside of the shop three or more days for the final application of two coats of paint and stenciling. The use of quick-drying paints, which apparently have already demonstrated satisfactory durability and wearing qualities, permits the application of two coats of paint and possibly stenciling on the same day. The result is that freight equipment is made available for service two days sooner than it would be otherwise—an important consideration, especially when, as often happens, a particular type of car is badly needed.

In the past two decades, it is not too much to say that equipment-painting costs and shopping time have been reduced 50 per cent, or more, and without any essential sacrifice in the appearance of the equipment, this achievement being one of which master painters, as a class, may well be proud.

Progress Was Made In 1932

Considering the disheartening array of unsolved economic, political and social problems which have been emphasized (not created) by the depression, and their more or less close relationship to the present predicament of the railroads, the annual report of progress in railroad mechanical engineering which was presented by the Railroad Division at the 1932 annual meeting of the American Society of Mechanical Engineers contains much encouragement. According to the report, the year 1932 has seen the further development of high locomotive steam pressures; improvements to and increased utilization of poppet valve gears; further application of roller bearings to cars and locomotives; improved materials, especially alloy steels and steel-casting applications; installation of several new types of passenger cars; the further development of improved freight equipment, with special reference to trucks; special types of cars, etc. Even though the money available for experimental and development work in the improvement of railroad rolling stock has amounted to considerably less than in previous years, important progress has been made.

The engineer has been blamed for many of the economic ills that have come to us during the past three years. There will be some who, after reading the progress report of the Railroad Division and similar reports of progress in other industries which are presented at these annual meetings by the various divisions of the society, will contend that the engineer is too stubborn to be convinced that his creations and inventions are leading the world to ruin.

Perhaps it is impossible for the political and social phases of our life to keep pace with engineering development. It is only too evident that some means of controlling all these things is sorely needed. Any discussion of these problems involves lengthy argument. However, the engineer and technician is broadening his thinking from the narrow field of pure technique, and as we list the items covered in the progress report of the Railroad Division, it is evident that what has been done to improve railroad equipment has, in the long run, both economic and social value.

NEW BOOKS

HIGH SPEED DIESEL ENGINES. *By P. M. Heldt, member, Society of Automotive Engineers, and Engineering Editor, Automotive Industries. Published by P. M. Heldt, 3804 Locust street, Philadelphia, Pa. 312 pages, illustrated. Cloth bound. Price, $4.*

This book, which deals with the subject from the technical point of view, is based on results of research and development work carried out in this country and in Europe during the past decade. In the first chapter, the probable future fields of the engine are discussed and a number of examples of its successful application are cited. The second chapter is devoted to the thermodynamics of the Diesel cycle, of which subject only a brief exposition is given. In the third chapter combustion phenomena in the cylinders of the Diesel engine, as revealed by indicator diagrams, are dealt with, while the fourth chapter relates to Diesel-engine Fuels. Two of the chapters relate to atomizers and injection pumps, respectively, and contain illustrated descriptions of numerous injectors and pumps in actual use. Other chapters are devoted to the two-cycle type of engine; aircraft engines of the Diesel type; air-injection, precombustion-chamber, direct-injection and air-chamber type oil engines, etc.

INTERNAL COMBUSTION LOCOMOTIVES AND MOTOR COACHES. *By Prof. I. Franco, M.E., late superintendent of motive power, electric traction division, and P. Labryn, M.E., chief engineer construction department, Netherlands Railways. Published by the Simmons-Boardman Publishing Company, 30 Church street, New York. 250 pages; 185 illustrations; 7½ in. by 9⅝ in. Price, cloth bound, $4.*

This book covers the different types of internal combustion engines applied to rail motor cars and locomotives by the various railroads of the world. The American installations covered include Diesel-electric locomotives for the New York Central, New Jersey Central, Long Island, and the Canadian National. Diesel-electric motor coaches of the Pennsylvania and five models of those produced by the J. G. Brill Company are also described. The authors have discussed the problem of the application of internal combustion engines as solved by the various companies and they have included details and simple descriptions of many locomotives now in service.

The book is divided into seven main sections; the first four of which are entitled, the engine, the transmission, types of locomotives already built, and types of motor coaches already built. The section on transmission is unusually complete and includes the developments of direct drive, mechanical drive, pneumatic transmission, hydraulic transmission and electric transmission. The section on locomotives includes descriptions of the Diesel-electric locomotive developments in Russia, with which readers of the *Railway Mechanical Engineer* are familiar, and developments in Germany, Switzerland and France. The outstanding Diesel locomotive developments in the United States and Canada are covered in considerable detail. The section on rail-motor cars covers a large territory, including Germany, Hungary, Netherlands, France, Switzerland, Finland, Great Britain and Brazil. Sections 5 and 6 of the book are devoted to problems of design, such as determining engine power, and the last section, 7, is devoted to a bibliography of articles which have appeared in railway technical publications.

THE READER'S PAGE

Increasing Tire Mileage On 2-10-0 Type Locomotives

To the Editor:

A number of articles have been written showing how some of the trunk lines are truing their driving-wheel tires without removing the tires from the wheels or the wheels from the locomotive. This is doubtless a paying proposition in some cases, especially on railroads with plenty of business and with means for experimentation, and with the object in view of keeping the power in service. But, after all, do these methods really get the desired results on tires that have become worn out of round or flattened by quarter-slipping, and do they not waste a large amount of time and thickness of tire in getting the tires round and bringing them to the same diameter?

The smaller railroads with their limited number of locomotives and limited resources, necessarily cutting corners to make ends meet, are not in position to do costly experimenting and cannot afford costly apparatus for this or any other purpose.

One short line railroad in the south has many hills and curves and with nearly every hill a curve or reverse curve. This makes it necessary to use sand when handling heavy trains—a condition conducive to rapid wear on tires. This road has increased its tire mileage approximately 66 2/3 per cent on one class of locomotive by purchasing an extra pair of plain tires for each set of tires on locomotives of this particular class.

On the type of locomotives in question, the 2-10-0, or Decapod type, the main driving wheels are equipped with plain tires, the balance having flanges. The plain tires are partly to relieve flange friction, but principally to enable the locomotive to pass around curves of greater degree. While rounding the curves these plain tires, on account of being in the center of the rigid wheel base, are the pivotal point upon which the whole locomotive pivots and swings around. The remaining tires follow the rails, the plain tires thus having a grinding or twisting motion on the rail as well as a rolling motion, and this, especially when sand is used, causes excessive wear on the plain tires. In addition to this, the quarter-slipping flattens them, this flattening being more pronounced on the left tire and occurs at the point on this particular tire that is in contact with the rail as the crank pins on that side are passing forward of dead center.

Although the brake shoes keep the shoulders on each side of the tread worn down to within the limit of wear as allowed by the federal-inspection rules, the calipers will show that the main tires are smaller than the others. Without going into a useless lengthy technical explanation as to the causes of the main tires wearing faster than the others or the quarter-slipping occurring, it is well known by every practical shop foreman or machinist that this does happen. When the cause cannot be removed, means must be brought about to get the best results under the existing conditions.

The tires on this class of locomotive when new are 3 in. thick and are worn to the limit at about 40,000 miles. The flanged tires will true up at 2¾ in. in thickness, while the plain tires, due to the excessive wear and flattening, will true up at approximately 2½ in. By using the extra pair of tires 2¾ in. thick and matching these with the flanged tires, a saving of ¼ in. in thickness, or 40,000 miles, is effected. After the next 40,000 miles the original plain tires are again used at 2½ in., and then after the next 40,000 miles the extra pair is again used, and so on, alternating the plain tires at each turning until the complete set is worn out. This method gives four turnings or five wearings and 200,000 miles, or a saving of 40,000 miles at each alternate turning as against two turnings or three wearings and 120,000 miles when the extra pair of tires is not used. This makes an increase of 80,000 miles, or 66 2/3 per cent more mileage on each set of tires, or, on this particular railroad, nearly two years more service per set of tires.

In changing tires the locomotive is not held out of service until the tires are turned. An extra set of tires is kept on hand ready to apply, this extra set not being an added expense in the long run, but a time-saver in the renewal of tires. The locomotive is placed over the drop pit and the front wheels removed from the locomotive, as the tires cannot be changed without this. The 10 tires are changed and the locomotive is again ready for service after losing from two to three trips off the run.

Another practice on this railroad is to turn all main tires on locomotives 1/16 in. larger in diameter than the others, as the main tires wear faster than the others. This is permissible under the federal-inspection rules. Although this slight difference does not prove detrimental in any way to the performance or wear of the locomotives, it gives, in cases where tires are renewed on account of tread wear, an additional amount of tire mileage between renewals equal to the time or mileage required to wear the main tires down to the same diameter as the others.

G. DEMPSTER,
Master Mechanic.

A Cure for Lathe Chattering

TO THE EDITOR:

I should like to contribute the following comments on lathe chattering in the hope that there are other readers of the *Railway Mechanical Engineer* who may have developed some better cure for chattering than that given in the following paragraphs. It is admitted that much of this trouble is overcome by modern tools. However, there are a number of us who still have to put up with wheel lathes and other types of lathes which are not modern and, unless business picks up, it looks as though we will have them for some time to come.

Chattering is the limiting factor when heavy cuts and coarse feeds are considered. There are a number of contributing causes, most of which are familiar to practical men. The use of back-set planers and shaper tools will take the chatter out of planer work. The use of "spring" threading tools will help as far as thread cutting is concerned. But spring lathe tools are not adapted to heavy cuts and coarse feeds. Setting up the lathe headstock bearings will often stop violent chattering.

If a centered mandrel is placed between the lathe centers to hold back any end play in the spindle bearings this will help stop chatter when facing work in a chuck and will also assist in getting a perfectly true surface on

the part faced. If the work extends over the center of the chuck, making the use of a mandrel on the centers to hold back end play impossible, the tailstock center itself may be brought up against the work.

Once I had to face several dozen steel discs about 12 in. in diameter. To make the parts conform to the print it was necessary to remove ½ in. of stock from certain parts of the forgings. A bad chattering occured when using a ¼-in. cut and rather fine feed and was noticed especially near the periphery of the disc. I tightened the spindle bearings until the lathe threw the line shaft belt a couple of times, but without improvement. I then tried several different shaped tools. A newly tempered tool that had just come from the blacksmith shop was finally tried. This tool had a slightly blunt edge, for although ground before tempering it had not been ground after tempering. This tool took a ¼-in. cut without chattering. It would, therefore, appear that the condition of the cutting edge, as well as its shape, had a great deal to do with chattering.

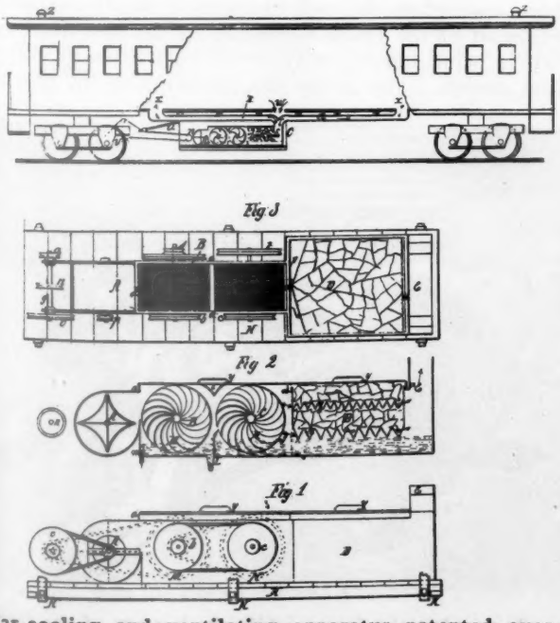
In turning long work on centers the chatter may be due to the spring of the work which a steady rest or follower rest will help. A dog, or driver with two arms, driving from both sides of the face plate, will assist in eliminating chatter in connection with centered work. If a piece of lead is placed between the dog and face plate where the strain comes, it will absorb some of the vibration. Often a change in the feed or speed of the machine will correct the trouble, for at certain speeds the period of vibration of the work and parts of the machine seem to coincide. The cutting point of the tool should be well supported and as close to the tool post as possible.

MACHINE-SHOP FOREMAN.

Air-Conditioning In 1855

TO THE EDITOR:

In view of the editorial and excellent articles on air-conditioning of railway cars which appeared in recent issues of the *Railway Mechanical Engineer,* I think you will be interested in the attached photostat of U. S. Patent No. 12851, dated May 15, 1855, which was granted to Job R. Barry of Philadelphia, Pa.



Car-cooling and ventilating apparatus patented over 77 years ago by Job R. Barry, of Philadelphia, Pa.

This patent is very interesting as it describes the principles which are used in some of the modern air-conditioning equipment for railway cars. It also indicates that the question of air-conditioning confronted the railways as far back as 1855 and at that time undoubtedly considerable thought was given to this problem. The commercial development of air-conditioning equipment for railway cars, of course, awaited the development of the electric generator, motor, and mechanical refrigeration equipment.

Seventy-seven years to commercialize an idea and answer a problem which has confronted the railways for that time seems a mighty long time to wait.

I am writing you this letter, thinking, perhaps, you and the readers of the *Railway Mechanical Engineer* will find as much interest in this patent as I have.

C. E. CAREY.

Why Not a Repeal of Service?

To the Editor:

We hear and read voluminous arguments for the repeal of the Eighteenth Amendment and what it will do for the country in general.

There is one repeal within the railroad and railway supply industries that, in the opinion of the writer, would have far reaching effect toward helping those industries to lower cost and increased activity—the repeal of the "service" practice. This practice of rendering so-called "free service" to the railroads of products sold by the supply companies is of many years' standing and seems to be as firmly intrenched as the Eighteenth Amendment.

This service is anything but free. It necessitates the hiring and maintaining of large service departments. These men not only receive good salaries, but also have expense accounts that in many cases exceed their salaries. The railroads are called upon to furnish free transportation over their lines. Invariably these service representatives are recruited from the railroads themselves; very often from the very roads they service. The expense of maintaining these departments is naturally included in the selling price to the railroads. If this unlimited free service were discontinued, it would permit the railroads to purchase more of these needed devices for the same cash outlay and to reap correspondingly greater benefits. It would mean increased volume for the railway supply companies.

The fact that the men comprising these service departments are recruited from the railroads is proof that the railroads themselves have the personnel with the ability to maintain such equipment.

Instead of large and expensive service departments, the supply companies could maintain an educational staff of a few men who would be free to spend a limited time on any road purchasing a device for the first time and instruct the railroad forces as to its operation and maintenance. If additional counsel were desired at any time, a nominal charge could be made for such service. With such a system only the railroad requiring special service would be called upon to stand the cost of such counsel.

At the present time when the service departments of supply companies are reduced to a minimum force, this practice could be put into effect without causing additional unemployment. The railroads ultimately would receive the benefit of reduced prices and the supply companies a greater volume of business.

Why not repeal?

JOHN JONES.

With the Car Foremen and Inspectors

Portable Jack for Handling Car Wheels

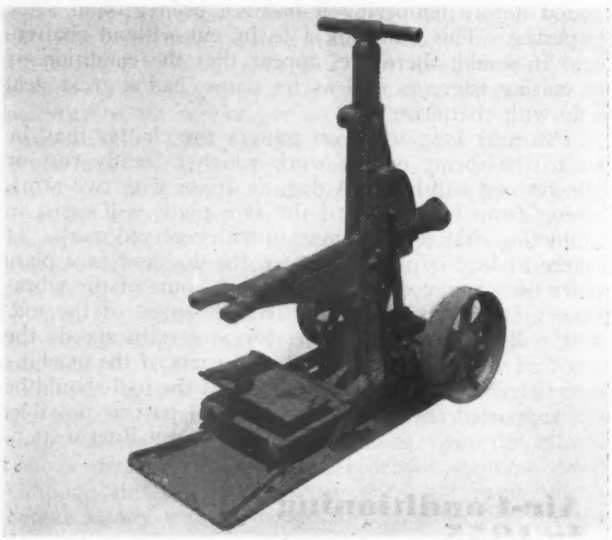
*By P. G. Stultz**

MANY of the freight cars built during the past ten years have trucks equipped with integral cast-steel side frames. The cost of maintaining this type of truck frame is low as compared with the old style arch-bar and Andrews-type frames, since the numerous column bolts, nuts and other miscellaneous parts are eliminated.

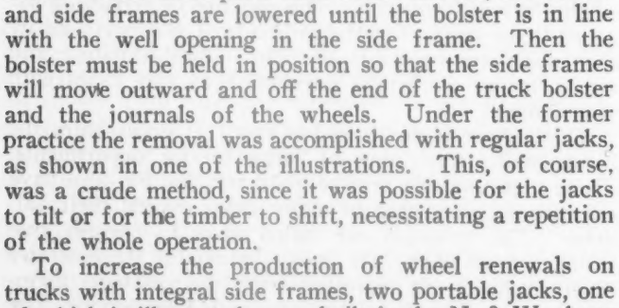
The only difficulty encountered in the use of the integral side frame appears when it becomes necessary to remove and apply a pair of wheels. In order to remove the wheels, the bolster and both side frames must be jacked up so that all the weight is off the journals. The truck spring, spring plank, journal wedges and brasses can be removed easily after the weight has been lifted. After these parts have been removed, the bolster and side frames are lowered until the bolster is in line with the well opening in the side frame. Then the bolster must be held in position so that the side frames will move outward and off the end of the truck bolster and the journals of the wheels. Under the former practice the removal was accomplished with regular jacks, as shown in one of the illustrations. This, of course, was a crude method, since it was possible for the jacks to tilt or for the timber to shift, necessitating a repetition of the whole operation.

To increase the production of wheel renewals on trucks with integral side frames, two portable jacks, one of which is illustrated, were built in the N. & W. shops at West Roanoke, Va. The use of these jacks has saved considerable time on wheel renewals and has also helped to make shop work just a little safer.

These jacks were made from ordinary car jacks by adding a base with a movable table. The table moves on rollers which are mounted on trunnions welded to the base. It is moved in and out by means of a lever and ratchet arrangement. The ratchet meshes with a rack gear which also serves as the frame for one side of the table. The lifting bar has been modified as shown and is long enough to allow the frame and bolster to be jacked at one time. One of the illustrations shows the truck and position of the jack after the removal of the journal brasses, etc. Another illustration shows the bolster lowered to the well opening in the frame, while the bottom of the frame is resting on the movable table which is being moved away from the wheels by means of the ratchet. This is the last operation as the moving

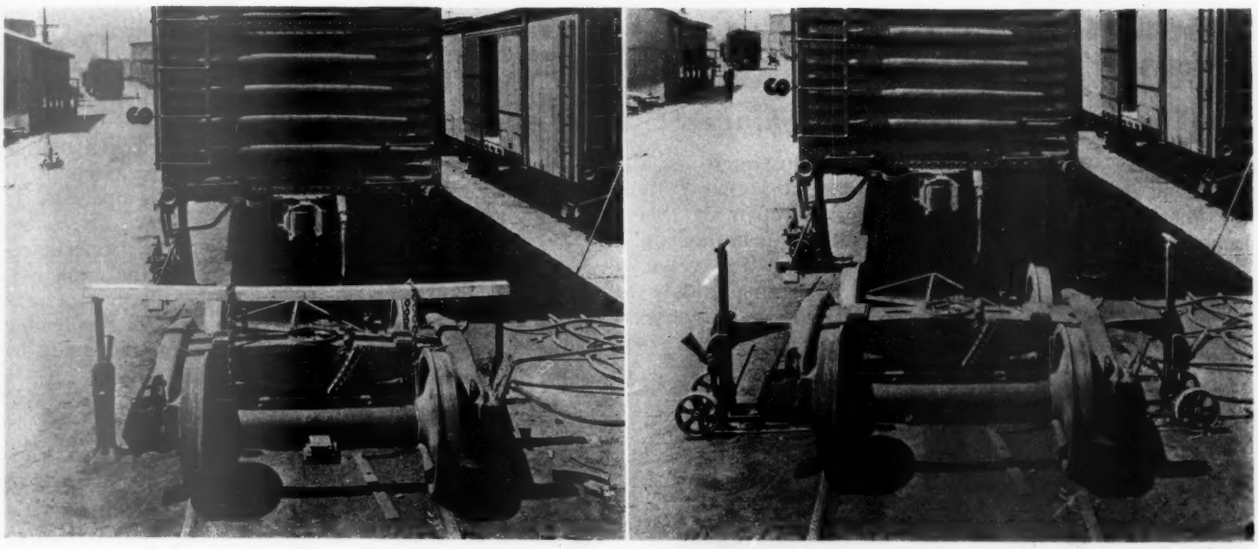


Standard jack modified to facilitate the changing of wheels on trucks equipped with cast-iron side frames



Left, removing the frame from the journal; the bolster has been lowered in the frame, while the bottom of the frame rests on the jack table—Right, position of the jack after the journal brasses have been removed

* Car foreman, Norfolk & Western, West Roanoke, Va., shops. The information and photographs for this article were furnished through the courtesy of the Norfolk & Western Magazine.



Left, old method of rigging up cast-steel trucks for changing wheels—Right, the new method using the modified jacks

of the table slips the journal boxes off the journals while the lifting bar still supports the bolster.

The new jacks have proved successful in operation and save considerable time and effort. They also enable the shopmen to replace and remove wheels without striking or scoring journals.

Common Conditions Causing Hot Boxes

*By P. P. Barthelemy**

This is the second instalment of a series of definitions of terms and conditions directly related to the hot-box problem. The first instalment appeared in the November, 1932, issue of the *Railway Mechanical Engineer*, page 464.

Undersized journals—Journals that have become worn, approaching or reaching the scrapping limit, are more likely to run hot under extreme conditions than a full-sized journal, on account of reduced bearing area. These undersized journals also tend to run hot quicker than a full-sized journal when a new bearing is applied, on account of the difference in radius of the two, requiring considerable running before a sufficient bearing area is produced to permit ample lubrication.

Seamy journals—This defect is in the nature of a seam running approximately lengthwise of the journal. This tends to open and drag on the babbitt. It indicates usually defective manufacture, and such axles must not be continued in service.

Slag lines—These occur in wrought-iron axles, of which only a few are now in service. These are dark lines running lengthwise of the journal, and are peculiar to wrought-iron, and do not affect the running properties of the journal unless they show an opening. These must not be confused with seams that occur in steel axles.

Transverse cracks—These are usually the result of an overheated journal. When dressing rough journals this defect must be watched for so as to prevent dangerous journals being returned to service.

Checked surface—This consists of minute checks in the glazed face of the journal due to mild overheating, ordinarily not serious. Combined with other unfavorable conditions it is likely to help start a box to run hot.

Improper finish of journal—The most common of which is rolling after too rough a cut. This produces fine scales rolled into the face of the journal that work loose after the journal has run a little, and tends to increase the friction, which with other unfavorable conditions is likely to cause a hot box.

Top face of end collar rough—Either due to improper finish or to having been bruised. A collar of this kind tends to drag the packing from the journal and may also induce a collar waste grab.

Rough end on journal—Has effect similar to that mentioned in the last definition pertaining to rough top face of end collar.

Burred edge center—This roughness may cause wadding and disarrangement of the packing. It also tends to shred packing in contact with the burred edge, producing a fluff that may later cause a wipe when this fluff is spooned in contact with the face of the journal. Burred edges around the center should be smoothed off in the wheel shop.

Rough collar—A roughness on the working face of the collar tends to increase the running friction.

Improper manufacture—This would cover all points such as oversized or undersized journals, collars improperly cut, surfaces improperly finished, etc.

Journal bearing—Improper dimensions, due to faulty manufacture.

Poor grade of babbitt—A good grade of bearing metal is absolutely necessary for journal bearings.

Hard spots in babbitt—This is due to the use of an inferior grade of babbitt and must not be confused with bright spots occurring just back of a waste wipe.

Brass not properly finished and tinned—To insure a thorough adhesion of the babbitt to the brass, proper finishing and tinning are necessary. If the babbitt becomes loosened from the brass, it tends to squeeze or "syrup" out, leaving a low spot at that point, thus causing a reduced and uneven bearing.

Babbitt loose in brass—Loose babbitt tends to hammer out from the pounding effect between the journal and the bearing and tends to maintain a contour considerably larger than the contour of the journal, resulting in a reduced bearing area and restricted lubrication. When the babbitt is loose, it also tends to insulate itself from the body of the brass, due to the presence of oil and air cells. The surface heat of the babbitt is much higher than it would be if the heat was more readily dissipated through the body of the bearing. This results in a gradual softening of the babbitt and squeezing out through the hammer effect referred to above. Cracks in the face of the babbitt indicate loosening of same from the body of the bearing.

Surface of babbitt uneven—Due to this the initial bearing area on the journal is very small and the box is liable to run hot before a sufficient area has been worn into the bearing to permit safe lubricating action.

Bearing overlength—When found, usually due to babbitt overlapping one or both ends of the body of the bearing.

Lumps on back of brass—These should be removed at the foundry, but if overlooked, should be removed before the bearing is applied to the car, as such a condition is likely to cause an uneven distribution of load on the journal.

Reversed running direction—This brings about a difference in alinement between the journal and bearing that may cause restricted lubrication. May also invite a grab when packing arrangement is disturbed.

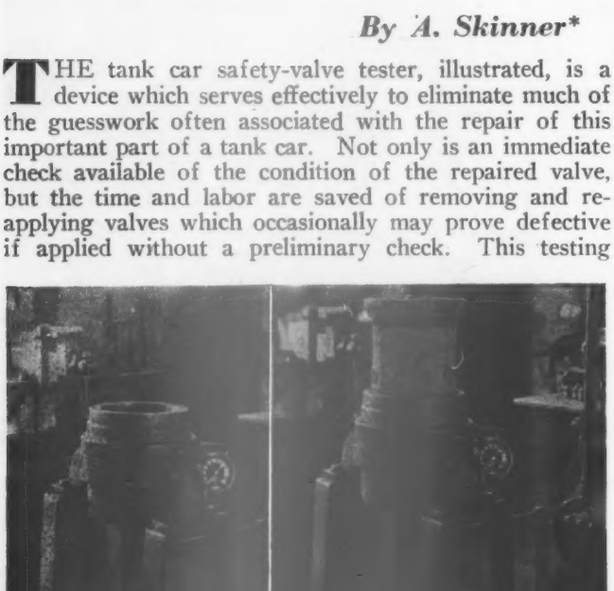
Top of bearing not true—Resulting in uneven pressure on the journal on account of improper seating.

* Assistant master car builder, Great Northern, St. Paul, Minn.

Tank Car Safety Valve Tester

*By A. Skinner**

THE tank car safety-valve tester, illustrated, is a device which serves effectively to eliminate much of the guesswork often associated with the repair of this important part of a tank car. Not only is an immediate check available of the condition of the repaired valve, but the time and labor are saved of removing and reapplying valves which occasionally may prove defective if applied without a preliminary check. This testing



Tank-car safety-valve testing device with and without the safety-valve in place

device should be installed adjacent to the rip track so that it will be available for use at any time and without unnecessary movement of valves a long distance to and from the cars.

The device can be readily constructed at small cost, most of the material being available round the shop or at the scrap dock. The tester rests on two 2½-in. by ⅜-in. pieces of bar iron bent to form four legs, which can be bolted to the floor and support the main part of the tester approximately 30 in. above the floor level. Two circular clamps made of the same material are forged and drilled so that they can be clamped firmly about an 8-in. coupling and bolted to the supporting bar iron. An 8-in. bushing is turned into the lower end of the coupling and welded in place, being drilled at the center to receive a ½-in. pipe connection from the shop air line and a gage which indicates the pressure A ¾-in. air cock in the vertical pipe controls the air supply to the tester. In the upper end of the 8-in. coupling is applied an 8-in. by 4-in. nipple, with an 8-in. by 7-in. reducing coupling and a ¼-in. air-release cock threaded to the upper end of the nipple. The safety valve, which has been overhauled and is ready for test, is then screwed into the top of the coupling. The illustration shows the tester before and after the application of the safety valve ready for testing.

In setting tank-car safety valves, the tolerance below or above the specified pressure is 1 lb. for a 12-lb. setting, 3 lb. for a 25-lb. setting and 5 lb. for a 200-lb. setting. For Class 1 and Class 2 cars handling products with a flash point below 20 deg., the safety valves are usually set at 25 lb. Safety valves on Class 3 and Class 4 cars are set at 25 lb. and on Class 5 cars at 200 lb. In testing these valves on the device (after the valve seat has been ground in and the valve assembled), the ¾-in. air cock, shown at the right, is opened. If the safety valve opens when the gage shows 25 lb. and does so intermittently, the valve has been properly repaired and is ready for installation on the tank car. If this intermittent action does not take place, necessary repairs can be made with the valve still on the testing device. Any adjustments in pressure can be made by means of the nut shown on top of the valve.

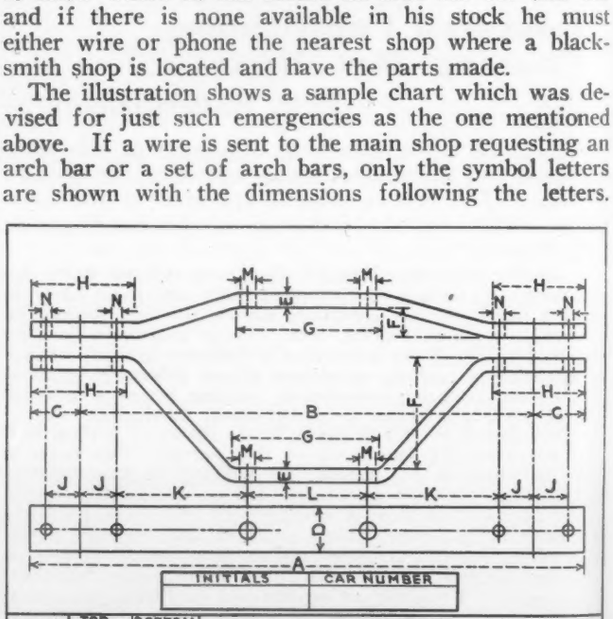
* General foreman, Atchison, Topeka & Santa Fe, Corwith (Chicago), Ill.

Chart for Ordering Arch Bars

ARCH-bar trucks are rapidly being removed from service, but there are thousands of freight cars still in service that are equipped with arch-bar trucks and for this reason they must be maintained until the cars are either retired from service or are taken into the shop and steel side frames substituted.

Occasionally a foreign car will be shopped out under load at some small car repair point where, due to present business conditions, the blacksmith shop has been discontinued. This car foreman must be in a position to know where he can secure an arch bar for this car and if there is none available in his stock he must either wire or phone the nearest shop where a blacksmith shop is located and have the parts made.

The illustration shows a sample chart which was devised for just such emergencies as the one mentioned above. If a wire is sent to the main shop requesting an arch bar or a set of arch bars, only the symbol letters are shown with the dimensions following the letters.



SYMBOL	TOP BAR	BOTTOM BAR	DESCRIPTION
A			Length of Arch Bar
B			Distance Between Center Lines of Boxes
C			Center Line of Box to End of Bar
D AND E			Size of Bar
F			Depth of Set
G			Length of Straight-Inside
H			Length of Straight-At End of Bar
J			Center of Journal to Box Bolt Holes
K			Center of Box Bolt Holes to Center of Col. Bolt Holes
M			Diameter of Column Bolt Holes
N			Diameter of Box Bolt Holes
L			Distance Between Center Lines of Col. Bolt Holes
No. REQ'D.			
REQ'N.			

REMARKS:

STATION DATE FOREMAN

Chart for ordering arch bars

The blacksmith shop foreman at the main shop has a copy of the blue print available and can easily mark down the dimensions which he receives from the outlying point. He is then in a position to furnish a set of arch bars that are sure to be satisfactory when they arrive at the smaller shop for application to the car.

These charts are either blue-printed or mimeographed and a supply is kept on hand at every small car repair shop where a blacksmith is not employed. In the event arch bars are required for an empty car the form is filled in and mailed to the main shop. Only when loaded foreign cars are held is the matter handled by 'phone or wire.

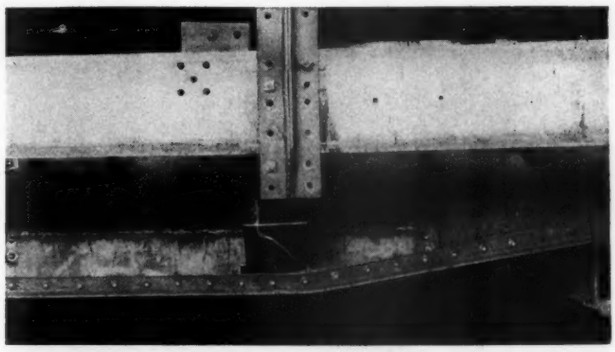
Repairing Center Sills

AN inspection of freight cars which have been in service for a number of years will disclose certain cars with badly-corroded center sills which require more or less extensive repairs to restore the full strength of the sill structure. Ordinarily, such repairs necessitate the removal of cover plates, cross ties, needle beams, body bolsters and practical dismantling of the car, comprising, therefore, quite an expensive operation. One way in which this work and expense can be greatly reduced is shown in the illustrations.

Center-sill corrosion usually takes place, in the case of fish-belly-type sills at the lower part of the sheet between the angle-iron bends where moisture gets in between the sheet and the angles, evaporating slowly and accelerating the corrosive action. In extreme cases, the center-sill sheets are completely corroded through at certain points, but without serious deterioration of the angles, or of the sheets 10 to 12 in. above the angles. In such cases, an ingenious method of repairs is followed, as illustrated at the Pittsburg (Kan.) shops of the Kansas City Southern.

This method consists simply of cutting off the rivet heads with a pneumatic rivet buster and backing out all rivets between the two angle-iron bends in the lower part of the fish-belly center sill. An oxyacetylene cutting torch is then used to cut the center-sill sheet along a line 10 to 12 in. above the angle iron. This section of sheet, about 20 ft. long, is completely severed from the main sheet and, by spreading the two angles slightly, is allowed to drop to the floor. This strip contains all of the defective or corroded parts of the center-sill sheet and leaves the remainder of the sheet at practically its original thickness.

A piece of new steel, 5/16 in. thick, is then cut to



Close-up view of the new sheet section inserted in the center sill

the same shape as the strip removed and put back in place in the center sill, using jacks to hold it up while being welded to the original sheet. This welding is performed with electrodes and the electric-welding process. The sheet is then drilled, rivets applied and the bottom of the sheet trimmed with the oxyacetylene torch where it projects through the angle irons.

With this method of repairs, then center sill has practically the equivalent of its original strength and is ready to give service for a number of years without further attention. Including an ample charge for stores expense and overhead, it is estimated that the cost of this job for a single web center sill is $12.65 for material, $11.60 for labor, or a total of $24.25. This figure must be compared with a substantially-larger amount when complete dismantling of the car structure is required.

Protection Cap For Triple Valves

TO prevent damage to the gasket seat of triple valves, especially where they fit against the reservoir, a car foreman has developed the cap or shield shown in the illustration. This is attached to each triple valve

Method of making repairs to a corroded center sill at the Kansas City Southern shops, Pittsburg, Kan.

when it is removed from the car and prevents damage to the seat while being handled to the triple-valve repair shop. After the triple valve is repaired the cap is again applied in the shop and prevents damage to the seat while the triple valve is en route to the car-repair track for re-application. A triple-valve gasket which is unfit

A pressed-steel cap like this protects the gasket seat on triple valves

for further use is applied under the cap which further protects the seat.

These caps can be made in the forge shops from sheet steel which after being heated can be pressed into the desired shape to fit the various types of triple valves. The cap shown in the illustration is made sufficiently large and with the necessary contour to make it suitable for use on every type of freight-car triple valve in present use.

Where triple valves are handled in containers, both in the shop and while in transit, it will be found that the protector cap will eliminate all damage to the seats.

Decisions of Arbitration Cases

(The Arbitration Committee of the A.R.A. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)

Joint Evidence Not Conclusive

Missouri Pacific cars Nos. 41477, 46458 and 73684 were shopped and repaired during December, 1930, by the New Orleans Public Belt Railroad on account of wheels with vertically worn flanges. These charges were included in its car repair bill No. 119258. Claims were filed by the Missouri Pacific requesting the withdrawal of these charges on the authority of joint-evidence cards executed by representatives of the Missouri Pacific and the Texas & Pacific. The N.O.P.B. refused to recognize the joint evidence obtained by the Missouri Pacific as being final because of joint evidence obtained December 12, 1930, which was executed by representatives of the Texas & New Orleans and the New Orleans Public Belt, and which indicated that the wheels were condemnable. The Missouri Pacific supported its argument with the original billing-repair card, together with the joint-evidence cards which it maintained were properly executed in accordance with the requirements of Rule 12, and expressed the opinion that the question to be decided was the validity of the joint-evidence card and claims arising under Rule 12 supported by a billing-repair card covering the material applied. The owner stated that it believed that if the attempt of the N.O.P.B. to offset the owner's claims with joint findings of its own representatives and representatives of the Texas & New Orleans, it would be destroying the intent of Rule 12 and numerous arbitration decisions recognizing the validity of claims of this description. It further stated that it was because of extensive repairs being made to its equipment in possession of the N.O.P.B. that it instructed its general car inspector to conduct an investigation relative to the bad ordering of cars and in this investigation the bad ordering of cars for wheels was given special attention. In its statement the N.O.P.B. pointed out that these cars were inspected and shopped by its interchange inspectors and were again inspected by its shop inspector and shop track foreman while the cars were on its shop tracks. The joint inspection of the T. & N. O. inspector and its master car builder found the wheels condemnable. A joint evidence to this effect was attached to the N. O. P. B. statement. The terminal line also opposed the contention of the Missouri Pacific and Texas & Pacific representatives that it was removing wheels too soon and that chalk should be used to determine whether or not the condemning limit had been reached. It was the opinion of the Terminal Railroad that the A. R. A. rules did not require this practice and that wheels should be gaged in accordance with the instructions shown in the wheel and axle manual and as per Fig. 4 as shown in the A. R. A. Rule 101.

The Arbitration Committee rendered the following decision April 7, 1932: "Rule 12 does not authorize the use of the joint-evidence card to determine whether or not repairs are made unnecessarily. Therefore, joint evidence used for this purpose has no standing under that rule and can be considered only as part of the argument. The New Orleans Public Belt Railroad has also submitted joint-inspection statement indicating that the wheels were properly condemnable by the A. R. A. gage. The evidence submitted by the Missouri Pacific is not conclusive. Therefore, its contention is not sustained." —*Case No. 1695, Missouri Pacific vs. New Orleans Public Belt Railroad.*

Cast-Steel Wheels Credited as Second-Hand

The Central Vermont changed the wheels under Louisville & Nashville car No. 102595 at its Italy, Vt., yards, December 14, 1930. Wrought-steel wheels were applied and Davis cast-steel wheels which were standard to the car were removed on account of one wheel having a worn flange and the other being second-hand. The handling line rendered a charge of $65.92 in its January, 1931, bill No. 382, allowing only scrap credit for the second-hand wheel removed. The bill was returned by the L. & N. claiming that credit for the second-hand cast-steel wheel should be allowed in accordance with Item 193, Rule 101. This bill was returned for the reason that cast-steel wheels are not A.R.A. standard. The Arbitration Committee was asked to render a decision as to whether the L. & N. was entitled to second-hand or scrap credit for the good second-hand wheel removed from the car. The L. & N. contended that it was entitled to $19.80 credit for the second-hand wheel,

as the first paragraph of Rule 101 states that a bill for repairs made under these rules shall be in conformity with the schedule of prices and credits for articles enumerated in the book of rules. The Central Vermont in its statement pointed out that it was unable to find any mention made in the A.R.A. Manual of Standard and Recommended Practice that the use of these wheels is recommended practice and it contended that the first paragraph of Rule 17 applied. It was the belief of the handling line that cast-steel wheels should come under the same category as steel-tired wheels and that the same decision as rendered in Case No. 1352 should cover. It contended that the A.R.A. rules did not contemplate that the repairing line should stand the loss in such cases.

The Arbitration Committee rendered the following decision: "Credit for the second-hand cast-steel wheel removed shall be allowed on the basis of second-hand price shown in Rule 101. The contention of the Louisville & Nashville is sustained."—*Case No. 1696, Louisville & Nashville vs. Central Vermont.*

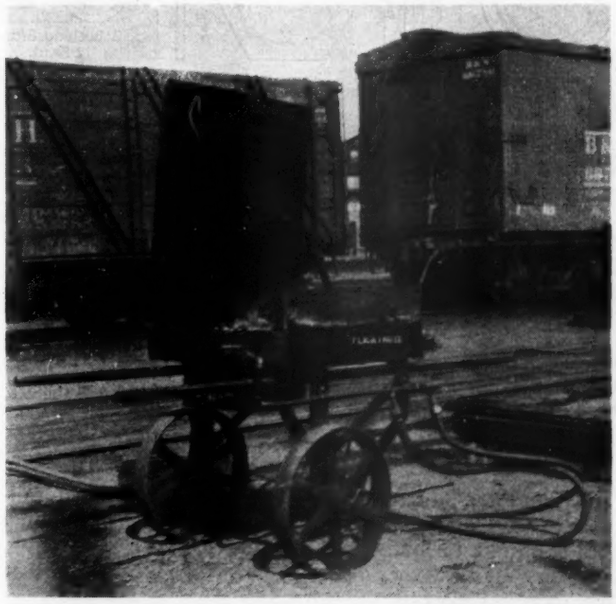
Car of Class E-4 Construction Destroyed

The Missouri Pacific badly damaged Western Railway of Alabama box car No. 15205 in its St. Louis, Mo., yards on July 14, 1931. The car was reported to the owners as being destroyed on July 14 with the request that they furnish a statement of depreciated value. The Western of Alabama furnished the A.R.A. depreciated-value statement attached to its letter of July 27, 1931. This statement showed the car to be a Class E-4 box car built new November, 1922, value $1,171.37. The two roads were unable to agree that this car met with the requirement of a new car at the time of construction in 1922. In its statement the Missouri Pacific pointed out that the car was of all-wood construction, 60 tons capacity; underframe constructed of six wood 5-in. by 10-in. longitudinal sills and two second-hand 4¼-in. steel rails which extended between the body bolsters and were riveted to the draft arm angle with three rivets at each end and bolted to the center sill with six bolts. The handling line claimed that the car was built in the owner's shops at Montgomery, Ala., from material obtained from dismantled cars. On request of the handling line, the Western of Alabama furnished a copy of the structure report, which was attached to the statement of the Missouri Pacific. This report covered five cars, of which car No. 15205 was one. The owner did not maintain a separate shop work sheet for each car built, but it admitted that second-hand steel rail was used for the subsills under the center sills when the car was built. In the absence of any previous decision by the Arbitration Committee, the Missouri Pacific contended that the application of this second-hand material in building the underframe of the car disqualified it as a new car at the time of construction and, therefore, it did not come under any of the provisions of Section e, Rule 112, which specifies the kind of second-hand material that can be used in the construction of a new car. The Western of Alabama contended that Section e, Paragraph 1, Rule 112, permits the use of such second-hand material in a new car and that when this car was released from the shop it met all the requirements for a new Class E-4 car. Had this car been turned out of the shop, the owner stated, minus this center-sill reinforcement, the car would have met all requirements for a new Class E-4 car and it does not appear reasonable that the addition of this rail reinforcement should change the status of the car to that of a rebuilt unit.

The following decision was rendered: "Information submitted shows that car was built in conformity with the requirements of Class E-4 construction as set forth in Rule 112. The addition of steel rails under the center sills to reinforce them is such as to not entitle the car to a higher classification under the rules, nor should it be considered that such reinforcement would reduce its classification to a lower class. It is considered that the car is correctly classified as new Class E-4 equipment."—*Case No. 1697, Missouri Pacific vs. Western Railway of Alabama.*

Portable Forge for The Car-Repair Yard

SHOWN in the illustration is a portable forge which has been designed for use outdoors in the car-repair yard. The forge is provided with a shield of sheet iron to protect the fire from storm and wind, and which can be folded down at night. It is supported on a frame of



Forge designed for service in the car-repair yard can be used in all kinds of weather

wrought iron, which is provided with handles at both ends. It is carried on three cast-iron wheels, arranged as shown.

The air for the blast is taken from the yard air line and passes through a length of rubber hose to a tee on one side of the forge. From this point it passes through a regulating valve, shown at the left of the illustration, to the coal-burning forge. A second valve at the opposite end of the forge is for a compressed-air hose connection to a riveting gun.

BATTLE FOR LOCOMOTIVE BELL.—A locomotive bell mounted on a wagon was given to the winner of the annual Wabash-DePauw football game on November 19 as a symbol of victory in what is said to be the oldest instance of gridiron rivalry to be found west of the Alleghany mountains. F. E. Lewis, general superintendent of the Chicago, Indianapolis & Louisville, contributed the bell, formerly used on a train running between Crawfordsville and Greencastle, where the colleges are situated, which has been used by the student bodies of the two schools for generations. At the close of the game, the winning eleven assumed custody of the bell, to retain it until the other team is victorious on the gridiron.

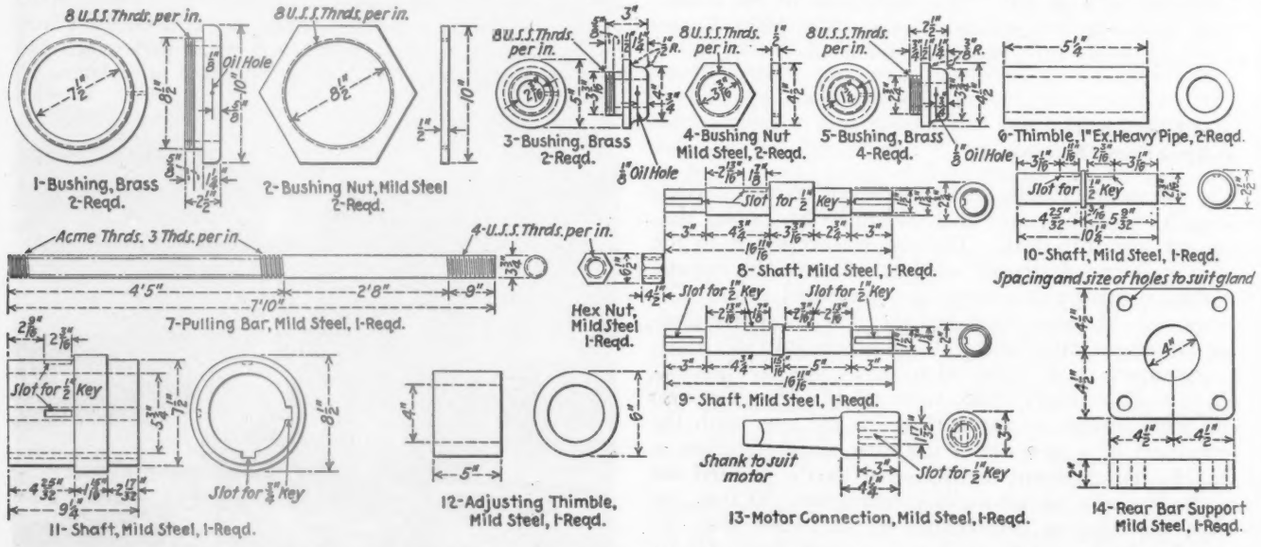
In the Back Shop and Enginehouse

Device for Pulling Cylinder Bushings

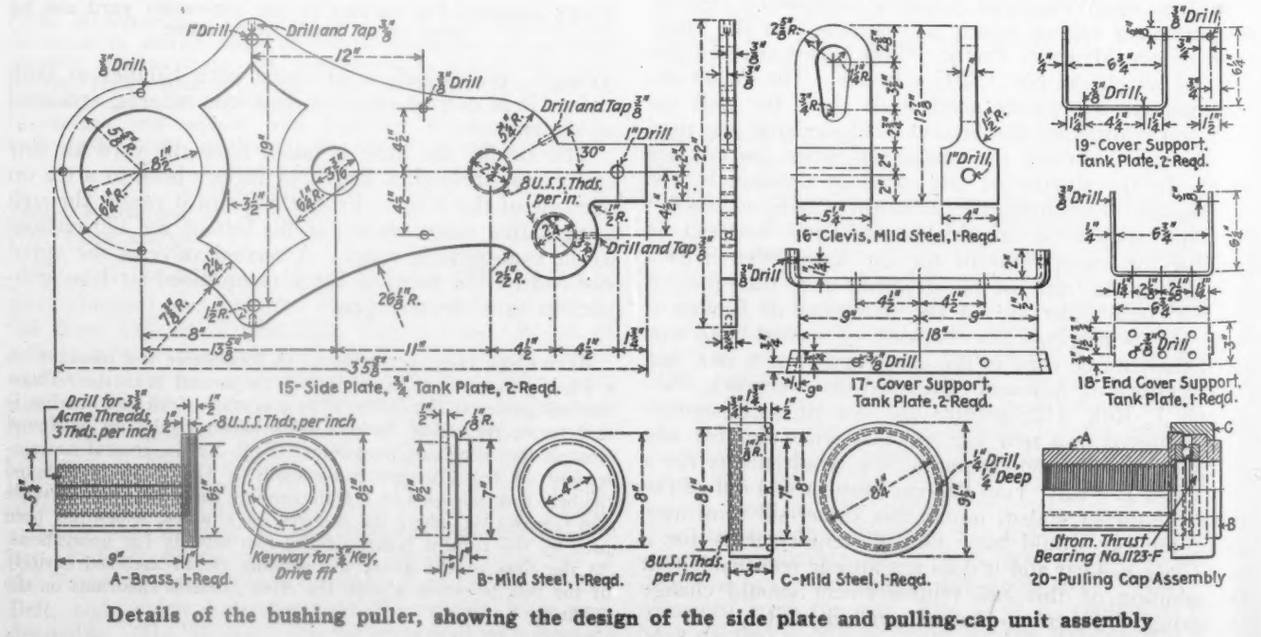
THE old inefficient method of pulling cylinder bushings in by hand has been superseded in most shops by some form of a power-driven machine. The device shown in the drawings has been used successfully and is standard practice on a large western railroad. With the exception of the gears, cast-iron pulling heads, brass bushings and pulling cap thrust bearing, the machine can be made in any shop equipped for locomotive repairs.

The numbered parts on the detail drawings refer to the numbers shown on the arrangement drawing. Power is supplied by an air motor. The motor connection *13* is made to suit the socket of the motor. This connection *13* may be used on either end of shafts *8* or *9*, depending on the amount of power required. Shaft *9* is keyed to a spur gear 10 in. in diameter, while shaft *8* is keyed to a smaller gear 3.333 in. in diameter. The ends of these two shafts extend out on both sides of the bushing puller, so that the workman can apply the motor and operate it from the most convenient location.

The 10-in. diameter spur gear meshes with an 18.8-in.

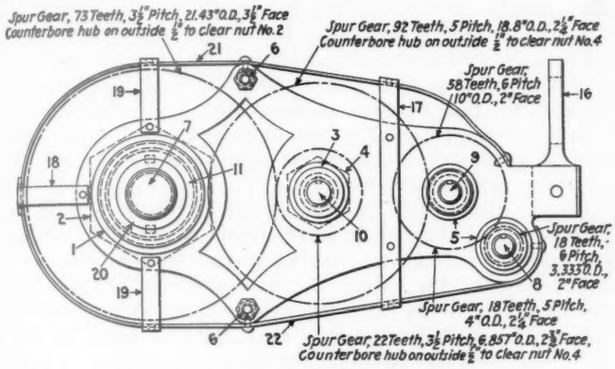


Details of the bushing puller—The number under each part refers to the part numbers on the assembly drawing



Details of the bushing puller, showing the design of the side plate and pulling-cap unit assembly

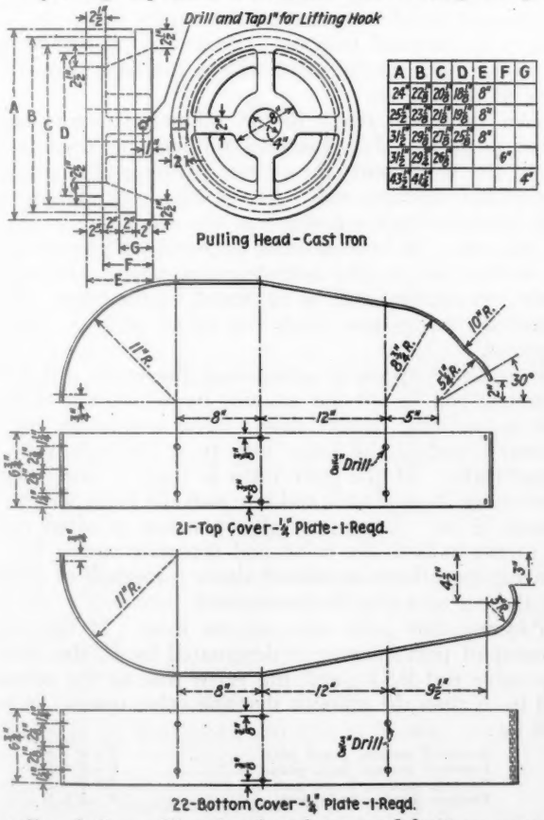
diameter gear which in turn meshes with a larger gear 21.43 in. in diameter. This gear turns the pulling bar *7* to which the pulling cap assembly *20* is keyed. The pulling bar is threaded as shown 4 ft. 5 in. of its length. These threads mesh with the threads in the pulling-cap unit *20*. The rotation of the bar causes the



Assembly drawing of the bushing puller

head to move along the pulling bar *7*. The pulling cap unit *20* consists of a Strom Bearings Company thrust bearing No. 1123-F and details, *A*, *B* and *C*.

Power is transmitted from the motor through the train of gears to shaft *11*, to which the pulling cap unit *20* is securely keyed. The pulling head which bears against the end of the cylinder bushing is forced back by the pulling cap unit *20* which moves along the pull-



A	B	C	D	E	F	G
24"	22⅞	20⅛	18⅛	8"		
25⅝	23⅞	21⅛	19⅛	8"		
31⅝	29⅞	27⅛	25⅛	8"		
31⅝	29⅞	26⅝			6"	
43⅝	41⅞					4"

Details of the pulling head and top and bottom covers

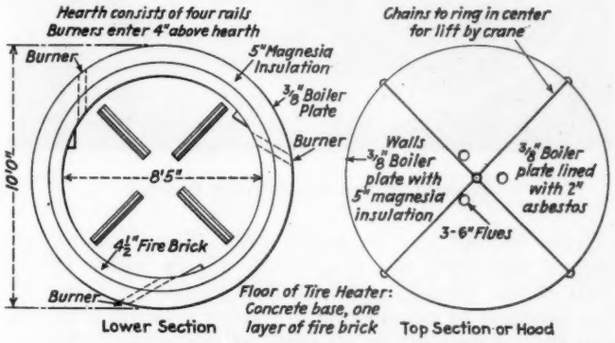
ing bar *7* as described. The pull at the rear is taken up by the rear bar support *14* which is drilled to suit the stuffing-gland bolts. The device is prevented from rotating when in operation by a chain block or other holding device secured to the clevis *16*.

The five pulling heads shown in one of the drawings take care of the range in cylinder-bushing sizes used on this railroad. The pulling heads, which are of cast iron; the adjusting thimble *12*, the rear bar support *14*, and the motor connection *13* are required for this set-up, but are not shown on the assembly drawing. The thimbles *6* are used as spacers between the two covers *21* and *22* and side plate *15*, while the adjusting thimble *12* slips over the pulling bar *7* at the rear bar support *14*.

Gas-Fired Tire Heater

By J. B. Nealy*

VARIOUS devices and furnaces have been devised for the heating of locomotive tires, all of which are more or less efficient. One of the best in use today is a gas-fired furnace which will heat eight tires at a



Arrangement drawing of the gas-fired tire heater

time. It was developed by the mechanical department of the Baltimore & Ohio. This furnace is of brick, cylindrical in shape and is built in two parts, the upper part of which can be raised by crane for loading and unloading.

The lower portion is 22 in. high and the upper 36 in.

Gas-fired tire heater with the cover in place

high while the apex of a conical roof rises 30 in. above this. Around the apex of this roof are arranged three 6-in. flues. The inside diameter is 8 ft. 5 in. and the

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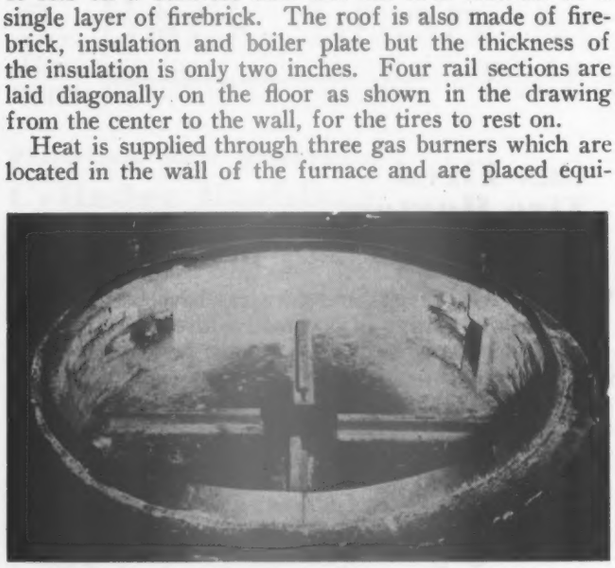
furnace wall is constructed of 4½ in. of firebrick on the inside backed up with 5 in. of magnesia insulation. The whole is encased in a steel shell of ⅜-in. boiler plate. It sets on a concrete base and the floor consists of a single layer of firebrick. The roof is also made of firebrick, insulation and boiler plate but the thickness of the insulation is only two inches. Four rail sections are laid diagonally on the floor as shown in the drawing from the center to the wall, for the tires to rest on.

Heat is supplied through three gas burners which are located in the wall of the furnace and are placed equi-



Interior of the tire-heating furnace

distant around the circumference. They are so arranged that they fire tangentially to the inside of the wall of the furnace and with this method of firing the hot products of combustion are given a swirling motion and thus distributed to all parts of the work. This insures the even distribution of heat which is necessary in this type of work. Furthermore these burners are of the inspirator type so that any furnace atmosphere, reducing, oxidizing or neutral can be obtained and automatically maintained regardless of the amount of work or fluctuation in the volume of fuel supply. This is obtained by the flexibility in proportioning the gas and air that this type of burner affords, the gas being supplied at high pressure and inspirating air in any ratio desired.

The tires heated weigh approximately 1,760 lb. each and a load of eight tires, weighs seven tons. To heat this load up requires 45 min. time with a gas consumption of 3,500 cu. ft. per hour. Four steel eyes are set in the brickwork of the upper section, near the top, and equi-distant about the circumference. Chains run from these to a ring over the center of the roof and are used to lift the top off the heater when charging and discharging.

The tires are bored to suit the wheel centers and are then brought by crane to the furnace and placed therein. The wheels are also moved from the lathes and placed adjacent to the furnace with the same crane. When the tires are hot the top section of the furnace is removed and the tires taken out, one at a time, with the crane and fitted onto the wheels. A spray of warm water is then played on the tires and the job is completed.

READY FOR ANYTHING.—One car company is ready, without further experiment or developments, to go into the business of transporting beer in the United States, if it is legalized. It is the General American Tank Car Corporation, which has had a number of special refrigerated tank cars for the transportation of beer in bulk in service in Canada for three years. Each of these cars can carry 6,000 gal. and it is estimated that eventually something like 1,000 of them will be required to handle bulk shipments from breweries to bottling points.

Calculation for Setting Baker and Walschaert Gears

By Harold Hopp

THE common method for adjusting improper valve position is by altering the length of the eccentric rod and the valve rod on a Baker gear or the radius rod on a Walschaert gear. These defects are determined by either placing the engine on rollers and observing the lead, the port opening at the center, or by trailing the engine and measuring the maximum port openings. The method presented in this article is applicable to either of the above mentioned methods.

Before presenting a method of determining these errors it would be well to have clearly in mind the effect that improper eccentric and valve-rod lengths have on the position of the valve. A valve rod that is too long will simply shift the valve toward the front of the engine. This will result in openings that are too large at the front port and too small at the back port. This is true whether the valve gear is set for forward or reverse motion. The front port opening will be the proper opening plus the valve-rod error. The back port will be opened to the proper value less the error. If the valve rod is too short the effect will be just the opposite.

The eccentric rod, because of the various components of the motion work, causes opposite effects in forward and reverse motion. This action is said to be direct in forward motion and indirect in reverse motion. An eccentric rod is too short the effect will be just the displaced toward the front of the engine when the valve gear is in forward motion. However if the valve gear be set for back-up the valve will be displaced toward the back of the engine.

This then will result in the following effects on the valve position. For forward motion the reading will be, at the front port, the proper opening plus the error due to the eccentric rod. At the back port, the opening will be the proper amount less the error due to the eccentric rod. In back-up, the forward port opening will be diminished by the eccentric-rod error, whereas the back-port opening will be increased by the error. If the eccentric rod is too short the effect will be just the opposite.

It is to be specially noted that the error due to the eccentric rod is not the amount by which the eccentric rod is too long or too short. The correction for the eccentric rod is the error due to it multiplied by the "gear ratio." If the gear ratio is four to one, then by shortening the eccentric rod one inch the valve will be displaced ¼ in. Improper valve position is often caused by errors in both the valve and eccentric rods. By correlating the effects explained above a method of correcting these errors may be determined.

Assume that both rods are too long. If the proper amount of port opening is designated by P, the error in the valve rod by V, and the error due to the eccentric rod by E then the amount that the valve opens the ports will be:

Forward motion, front port	$P+V+E$
Forward motion, back port	$P-V-E$
Reverse motion, front port	$P+V-E$
Reverse motion, back port	$P-V+E$

It is readily seen that by subtracting the reading in reverse motion, from port from forward motion, front port twice the error due to the eccentric rod will be obtained. This may be stated mathematically as:

$$(P+V+E)-(P+V-E)=2E$$

By taking half of this amount and multiplying by the gear ratio, the error in the eccentric rod is determined.

If the reading at reverse motion, back port is sub-

tracted from that at forward motion, front port twice the valve rod error will be obtained. This may be stated as:

$$(P+V+E)-(P-V+E)=2V$$

By taking half of this amount the error in the valve rod is determined.

When the valves are set by trailing, it is often impossible to have the valve gear set at exactly the same cut-off in forward and reverse motion. This manifests itself in unequal valve travel and may be observed because the sum of the forward-motion port openings are not equal to the sum of the port openings in reverse motion. Consider the example as shown in Fig. 1.

As will be noted, the sum of the forward motion port openings is 1¼ in. The reverse-motion openings add

Fig. 1

up to one inch. In order to apply the method presented herein, it will be necessary to equalize these sums. This may be done by adding to each of the reverse motion openings half of the difference between 1¼ in. and one inch. This is ⅛ in. The altered readings then are as shown in Fig. 2.

Summary of Method—Mark the amount of port opening by either trailing or on rollers. If necessary, equal-

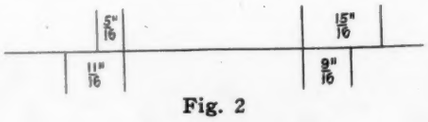


Fig. 2

ize the sum of the forward-motion readings with reverse-motion readings.

Eccentric-Rod Correction Subtract the reading at reverse motion, front port from forward motion, front port. Divide by two and multiply by the gear ratio.

Valve-Rod Correction—Subtract the reading at reverse motion, back port from that at forward motion, front port. Divide by two. If either, or both, of the results are negative the rod, or rods, are too short.

Example 1—Consider the case presented in Fig. 1 and

Fig. 3

Fig. 2. After the readings are altered we apply the formula. Eccentric rod correction:

$$\frac{15}{16}-\frac{9}{16}=\frac{3}{8}$$

$$\text{Divided by two}=\frac{3}{16}$$

Multiply by the gear ratio (let it be 4)

$$\frac{3}{16}\times 4=\frac{3}{4}$$

Therefore shorten the eccentric rod ¾ in.

Valve rod correction—

$$\frac{15}{16}-\frac{11}{16}=\frac{1}{4}$$

$$\text{Divided by two}=\frac{1}{8}$$

Therefore shorten the valve rod ⅛ in.

This will make both forward ports ⅝ in. and reverse ports ½ in.

Example 2.—Eccentric rod correction, referring to Fig. 3,

$$\frac{7}{16}-\frac{15}{16}=-\frac{1}{2}$$

$$\text{Divided by two}=-\frac{1}{4}$$

Multiplied by the gear ratio of 4

$$-\frac{1}{4}\times 4=-1$$

Valve rod correction

$$\frac{7}{16}-\frac{1}{16}=\frac{3}{8}$$

$$\text{Divided by two}=\frac{3}{16}$$

The corrections are: Lengthen the eccentric rod one inch and shorten the valve rod 3/16 in. The ports will be square all around at ½ in.

Making Valve Repairs to Engines on Rail-Motor Cars

By E. O. Whitfield

THE necessity for accurate valve work on internal-combustion motors is important as only slight errors in adjustment and workmanship can result in serious loss of horsepower. Again the replacement of cylinder heads on large engines runs into considerable money and if economy is to be exercised here, proper methods of welding broken heads must be utilized with the assurance that equipment will stay in service for reasonable periods of time and without attention. If

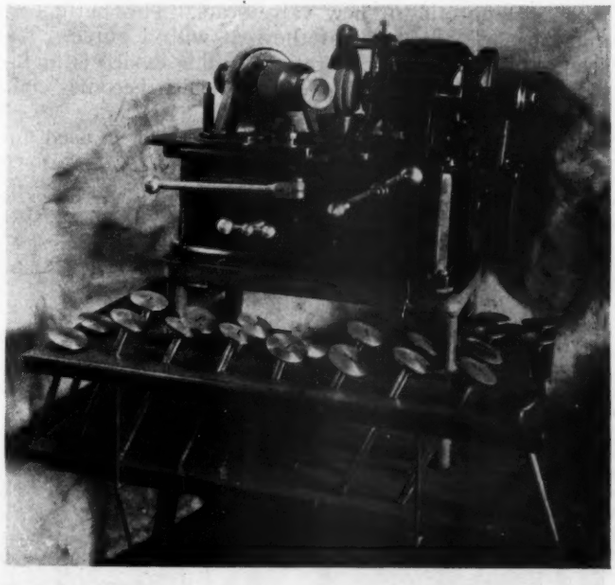


Fig. 1—Valve refacing tool and rack for holding the valves

this work is to be taken care of in the back shop, proper facilities and testing equipment should be available in order to insure accuracy.

Fig. 1 illustrates a valve refacing tool which is a fast and accurate commercial machine producing an excellent finish. It can be used for valves of any degree of angle. The valves finished here when placed in the seat which has been faced as shown in Fig. 2 can be ground in with a few rubs to a perfect seat which will hold a 90-lb. air pressure test without any loss whatever.

The valve rack which can be seen below the machine,

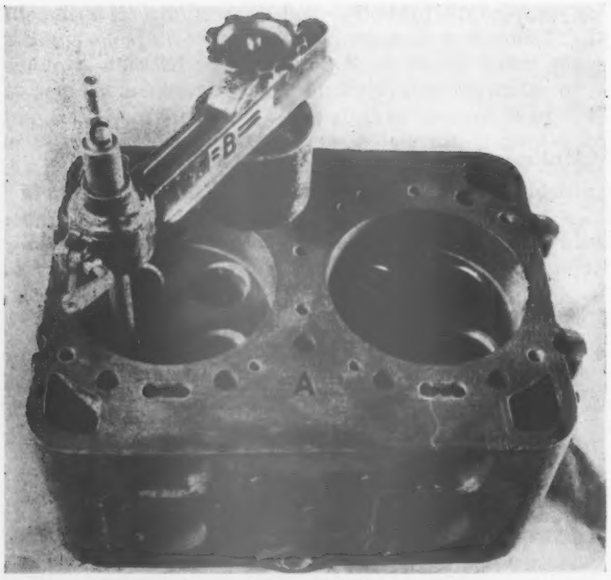


Fig. 2—Valve-seating and guide-reaming tool: The mandrel is operated by hand to face the valve seats, while an air motor is used to face new seats

Fig. 1, was manufactured in the railroad shops of sheet iron and drilled to receive the valves. The rack was bored and spot welded to stand as shown.

The valve-seating and guide-reaming tool shown in Fig. 2 is a commercial valve-seating and guide-reaming tool. *A* is the cylinder head; *B* the alining fixture; and *C* the cutter mandrel and pilot. The mandrel is operated by hand to face the valve seats and by air motor when milling out for new valve seats. This outfit permits absolute alinement of the seat with a guide. The secret of the effective operation of this device is in the ball joint in the pilot-guide holder which becomes rigid when the clamp handle is tightened.

Fig. 3 shows the apparatus and equipment used for testing valve springs: *A* shows the valve spring under test, *B* the spring-compression weights, *C* the weights for testing various springs and *D* the instruction sheet showing the free and loaded heights of the valve springs used. A spring is applied at *A*. Weights are added at *B* sufficient to compress to the specified compressed height. The spring is rejected if 10 per cent less weight is used than the correct spring compression should be. The slotted step collar above the spring and the treadle weight lift permit rapid operation.

Fig. 3—Apparatus used for testing valve springs

The spring-compression weights *B* and *C* are standard commercial scale weights. The weight *B* (50 lb. actual) is usually sufficient to start a spring in compression. While the weights *C* are used to complete the compression test. The angle plate supporting the valve and spring to be tested is made from machine steel, ½ in. by 6 in., and is bolted to the post. A screw eye located half way down the post acts as a guide for the rod, which is of ⅝ in. round steel. The spring retainer is slotted to allow quick removel and application of springs. The top of the rod is shouldered to prevent the spring retainer from slipping off. The post is reinforced with 6 in. by 4 in. timber to support the apparatus. The treadle is hinged to the base and is used to raise the weights to allow the application and removal of springs.

Fig. 4 shows the method of rebuilding cylinder-head valve seats. *A* shows the cylinder head and *B* the valve seats rebuilt by welding. The welding of worn out valve seats and broken cylinders has proven to be successful and economical. The welding operation must be carried out with considerable care to prevent the possibility of the casting warping. This means that the cylinder head must be properly preheated before the welding takes place and not allowed to cool too fast. Machining must be accurate and care taken to prevent the faces of the head becoming damaged in movement.

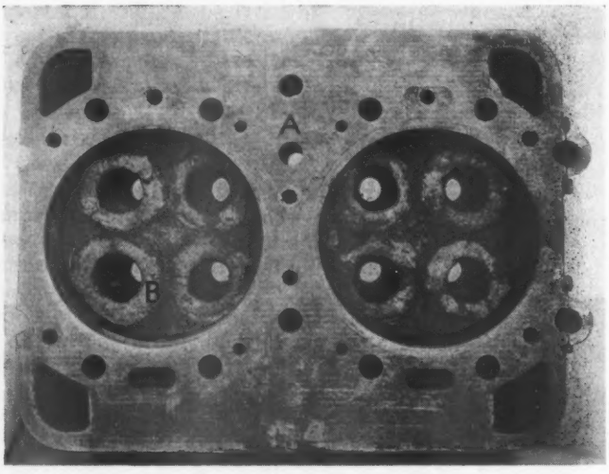


Fig. 4—Cylinder head, the valve seats of which have been reclaimed by welding

Preheating is handled in a charcoal furnace and the cylinder is welded while still in the furnace. Machining is performed in a vertical boring mill. The material used in welding is of cast iron. Reseating is performed as already explained in Fig. 2. In connection with the preservation of cylinder heads it is necessary to see that the inner core is frequently flushed out to remove any accumulation of scale which in itself forms a heat retainer and will cause cracking of the casting.

(*Turn to next left-hand page*)

BETTER MATERIALS
IS ONE WAY TO LOWER MAINTENANCE

WHEN, every two years, you spend on repairing a locomotive one quarter of its original cost, the materials you use are worthy of careful consideration. « No longer is steel just steel, to be used indiscriminately for all purposes. Years ago Republic metallurgists began the developments that have led to special analysis steels for particular railroad services. « An alloy steel gives new toughness to axles and protects against failures due to shocks at low temperature; side sheets of Toncan Iron resist corrosion and fire-cracking; alloy staybolts combine toughness and corrosion resistance—and so on thru all the uses of steel in railroad equipment. « For each, Republic has a maintenance-reducing material that will help lower the major item of operating expense.

Toncan Iron Boiler Tubes, Pipe, Plates, Culverts, Rivets, Staybolts, Tender Plates and Firebox Sheets • Sheets and Strip for special railroad purposes • Agathon Alloy Steels for Locomotive Parts • Agathon Engine Bolt Steel • Agathon Iron for pins and bushings • Agathon Staybolt Iron • Climax Steel Staybolts • Upson Bolts and Nuts • Track Material, Maney Guard Rail Assemblies • Enduro Stainless Steel for dining car equipment, for refrigeration cars and for firebox sheets • Agathon Nickel Forging Steel.

The Birdsboro Steel Foundry & Machine Company of Birdsboro, Penna., has manufactured and is prepared to supply under license, Toncan Copper Molybdenum Iron castings for locomotives.

CENTRAL ALLOY DIVISION

AGATHON STEELS

REPUBLIC STEEL
CORPORATION
MASSILLON OHIO

TONCAN COPPER MOLYBDENUM IRON

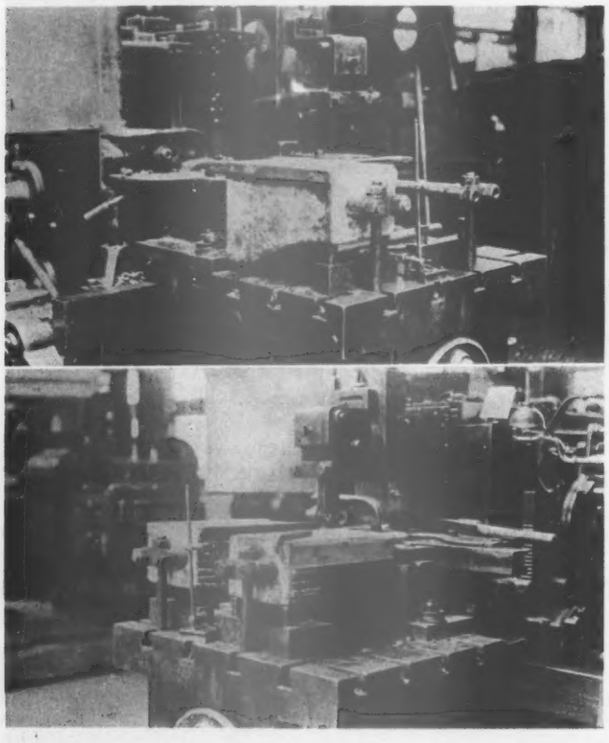
Reclaiming Worn Tender-Truck Pedestal

By H. W. Payne

WHEN the jaws of worn tender-truck pedestals are no longer serviceable, it is the practice in the shops of a western road to plane the jaws on the face and sides ¼ in. below the original surface. Then a ¼-in. steel shoe is spot welded on, which brings the wearing surface back to original size. After the pedestal is once machined, the maintenance is only the operation of cutting off the worn shoe and welding on a new one.

The truck is first turned up side down and the pedestals are laid out by the same method used on locomotive shoes and wedges—that is, placing 1-in. marks to plane to. The pedestals are then removed from the frame and sent to the draw-cut shaper to be machined by the following method:

A special 90-deg. angle plate is bolted and feather-keyed to the shaper table. Two pairs of studs are screwed into this angle plate which are ⅛ in. smaller than the

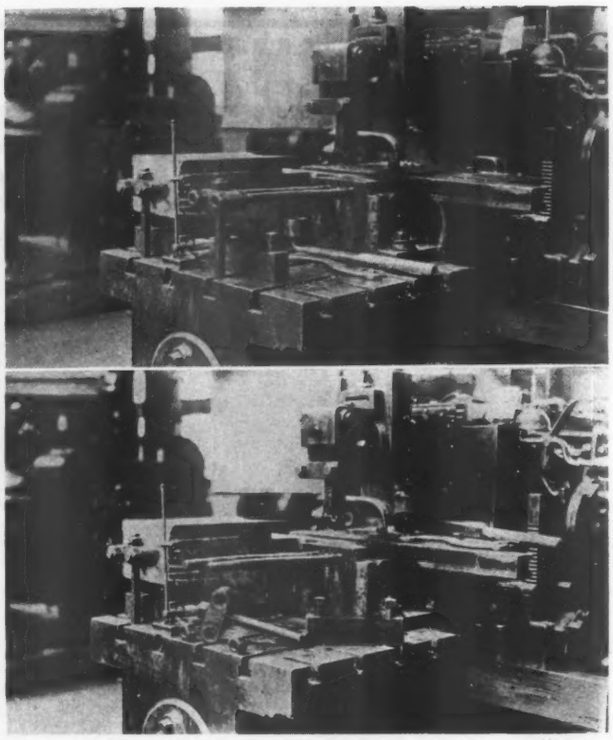


Top, side view of pedestal set up for machining—Bottom, one pedestal is set up while another is being machined

holes in the pedestal. This allows the pedestal to be shifted in setting up.

The pedestal is placed on the shaper, with the top against the angle plate and one pair of the studs passing through the bolt holes. To prevent the pedestal from rising when the tool strikes it, a T-headed bolt is placed in a slot in the shaper table and passed through a bar that is placed on a pair of the studs, after the pedestal and before the nuts are applied. These nuts are tightened snugly, which draws the pedestal against the face plate, leveling it lengthwise. A block, containing two ⅞-in. set screws, is placed under the unsupported end and is used as a jack to adjust the pedestal crosswise, setting to the 1-in. marks with a surface gage. The nuts are then securely tightened and the planing begins.

The machine operator then sets up another pedestal



Top, jig set up on the shaper with one pedestal in position Bottom, same view showing the removable parts of the jig lying on the table

on the other pair of studs, thereby eliminating the machine stop for set up, as there is sufficient time to remove a finished pedestal and set up another during the time required for a cut across the top of a pedestal.

(*Turn to next left-hand page*)

NEW USE FOR OLD FREIGHT CARS.—In the past, the Gulf, Mobile & Northern and the New Orleans Great Northern, in order to reclaim the metal and other usable parts of condemned freight cars, have followed the practice of burning the wood from the steel. But some 900 cars, now awaiting demolition, will be put to better use. Approximately 300 cars will be turned over to the New Orleans, La., Welfare Committee, so that the wood can be stripped off and given to needy families to furnish a supply of winter fuel. Another 300 cars are being given to the welfare committee at Bogalusa, La., and the remaining cars, which cannot be moved from their sidings on account of their present condition, will be put to similar good use by nearby communities.

A RECORD PASSENGER TRAIN.—Recently locomotive No. 1065 of the St. Louis-San Francisco broke a record when it hauled a train of 54 passenger cars, in which were 3,275 excursionists, a total distance of 21.9 miles on the Frisco's River division. The schedule did not call for No. 1065 to do such heavy work, but this was made necessary on account of an accident which disabled another engine. The occasion was a big excursion to St. Louis, Mo., from points on the Frisco's River division. A first train of 20 cars was formed at Wilson, Ark., and it made the run to St. Louis without incident. Another train, pulled by engine No. 1067, left Blytheville, Ark., with 26 cars, and picked up 8 more at Hayti. This train moved on to Sikeston, but there a motorist attempted to beat it to a crossing, with the result that engine No. 1067 was completely disabled. Engine No. 1065 came along from Hayti with a third train of 20 cars. Finding the disabled engine and the 34 stranded cars, it added the latter to its own train and moved into Chaffee where another engine was secured. From the front of the engine to the rear car, the train was three-quarters of a mile in length.

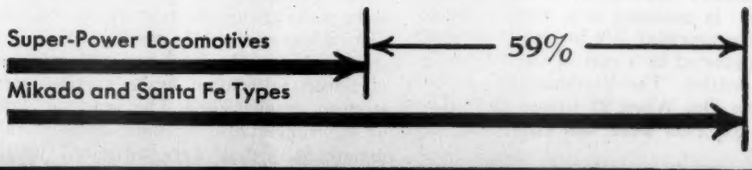
SUPER-POWER

LOCOMOTIVES CUT OPERATING COSTS

A study of actual operating data on one road showed that Super-Power Locomotives reduced operating costs 34%

Reduced Cost of Locomotive Repairs of 59%

Was Partially Responsible For This Saving



This is an indication of the reduction in repair costs which can be expected when the maintenance problem is directly considered in locomotive design.

Among the Clubs and Associations

CANADIAN RAILWAY CLUB.—On December 12 at 8 p. m. at the Windsor Hotel, Montreal, A. R. White, chief sanitary inspector of the Canadian National, will present a paper on Some Thoughts on Our Transportation Services.

NEW YORK RAILROAD CLUB.—The sixtieth anniversary dinner of the New York Railroad Club will be held in the Grand Ballroom of the Hotel Commodore, New York, on Thursday, December 15, at 7 p. m. An interesting speaking program and special entertainment features have been provided for the evening.

RAILWAY CLUB OF PITTSBURGH.—At the meeting of the Railway Club of Pittsburgh which will be held at 8 p. m. on December 22 at the Fort Pitt Hotel, Pittsburgh, Pa., Dr. Phillips Thomas, research engineer of the Westinghouse Electric & Manufacturing Company at East Pittsburgh, will present a paper on "Electrons at Work and at Play."

WESTERN RAILWAY CLUB.—Rufus C. Dawes, president, A Century of Progress, will discuss the "Chicago World's Fair Centennial Celebration before the meeting of the Western Railway Club which will be held at 7 p. m. on December 12 at the Hotel Sherman, Chicago. The special features of the evening will be the Ladies' Night dinner, dancing and entertainment.

NEW ENGLAND RAILROAD CLUB.—Some phases of the Present Railroad Situation will be discussed by C. E. Smith, vice-president of the New York, New Haven & Hartford, before the meeting of the New England Railroad Club which will be held on December 13 at the Hotel Statler, Boston, Mass., following dinner at 6:30 p.m.

INDIANAPOLIS CAR INSPECTION ASSOCIATION.—The A.R.A. interchange rules were discussed at the meeting of the Indianapolis Car Inspection Association held at the Hotel Severin, Indianapolis, Ind., on December 5.

NORTHWEST CAR MEN'S ASSOCIATION.—J. Marshall, special representative of the American Railway Association, was the speaker at the December 5 meeting of the Northwest Car Men's Association.

CENTRAL RAILWAY CLUB OF BUFFALO.—The December 8 meeting of the Central Railway Club was under the auspices of the Terminal Train Masters and General Yard Masters Association of the Niagara Frontier. It consisted of a musical sketch portraying everyday life in a railroad yard office, supported by a cast of twelve people. It was entitled "The Yardmaster," or "No One Goes Out When 95 Comes In." The officers for 1933 were also elected at this meeting.

PACIFIC RAILWAY CLUB.—The Pacific Railway Club held its Annual Associate Members Night at the Transportation Club, San Francisco, Cal., on December 8.

NORTHWEST CAR MEN'S ASSOCIATION.—With its October meeting, this association completed the first year of its existence, during which the membership grew to a total of 1,015 and a substantial bank balance was set up in favor of the association. Inasmuch as the first 12 months were more or less a period of organization for the association, and particularly in view of the excellent results secured with the present officers, the association voted at its October meeting to continue the present incumbents in office. It was also decided to add to the officers a third vice-president in the person of F. G. Moody, master car builder of the Northern Pacific. The officers of the association, therefore, for the ensuing year will include: President, F. J. Swanson, general car department supervisor, C. M. St. P. & P., Minneapolis, Minn.; first vice-president, J. M. Ryan, assistant master car builder, C. St. P. M. & O., Hudson, Wis.; second vice-president, G. J. Conklin, foreman of inspectors, Soo line, Minneapolis; third vice-president, F. G. Moody, master car builder, Northern Pacific, St. Paul, Minn.; treasurer, F. S. Leavitt, auditor, Minnesota Transfer Railway Company, St. Paul Minn.; secretary, E. N. Myers, chief interchange inspector, Minnesota Transfer Railway Company, St. Paul, Minn.

Club Papers

Air-Brake Maintenance

CAR FOREMAN'S ASSOCIATION OF CHICAGO.—Meeting held at Chicago, November 14. Subject, Maintenance and Repairs to Air Brakes, by L. M. Carlton, mechanical expert, Westinghouse Air Brake Company. ¶"Efficient air brakes are an asset—not a liability. They are a dividend-earner, as well as a safety device," is the pertinent manner in which Mr. Carlton summarized his address. The paper was replete with practical suggestions regarding maintenance methods and practices essential to the satisfactory performance of air-brakes in train operation. Such details as the elimination of foreign matter from the air-brake system; the secure attachment of brake cylinders, with carefully applied cylinder packing cups and cylinder protectors; thoroughly-overhauled triple valves and other valve mechanism; and correctly-proportioned foundation brake rigging, were strongly emphasized. The practical value of the suggestions for improved air-brake maintenance that were advanced in the paper was indicated by the extensive discussion participated in by a considerable number of air-brake instructors and car-department supervisors.

Railway Stores Department Problems

Western Railway Club.—Meeting held Monday evening, November 21, at the Hotel Sherman, Chicago. Subject "Railway Stores Department Problems," presented by D. C. Curtis, chief purchasing officer, Chicago, Milwaukee, St. Paul & Pacific, Chicago. ¶Predicting radical changes in transportation within the next two years, which are inevitable in a progressive nation, Mr. Curtis said that it is important for railway officers to adapt themselves to these changes and not make the mistake of opposing them. He maintained that too often railway department heads feel that they can economically handle the material requirements of their respective departments themselves, whereas this practice usually results in a surplus of materials, duplicate stocks, etc. The shop foreman, being judged by the number of locomotives or cars turned out each month, naturally will take no chances of being out of material needed to secure this output. The foreman of the operating department, also being judged by the performance of this department, has a tendency to carry an excessive stock to protect operation. ¶Regarding the subject of railway manufacture and purchases, the following two highly-pertinent paragraphs are quoted from the conclusion of Mr. Curtis's address: "We have the problem of repairing material necessary for replacement and the problem of manufacturing items which it is not practical to purchase. A railroad is organized for the purpose of providing transportation, and the financial control is too far removed from the actual operations for any railroad to make a success in manufacturing any items that can be purchased. A railroad has so many places for every dollar that it cannot advantageously invest these dollars in manufacturing machinery and appliances necessary to compete with the modern manufacturing plants that turn out material under production methods at the lowest possible cost. ¶"During the depression, we have sometimes felt that there is nothing left, that there is no activity, no orders, etc.; yet the railroads spent over $223,000,000 in the first six months of 1932. While we should have spent a great deal more fully to maintain the properties, we have materially helped industry, and we have safely maintained the service. With the co-operation of railroad men and the supply men who lend their assistance in furnishing material, in providing and directing the technical help to develop new devices, engines, cars, etc., we are going to work our way out of the depression, and the railroads are going to continue to be the important factor in transportation and give returns that will be satisfactory not alone to the patrons, but to the investors as well."

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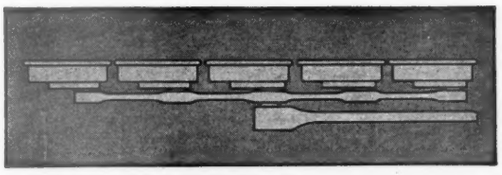
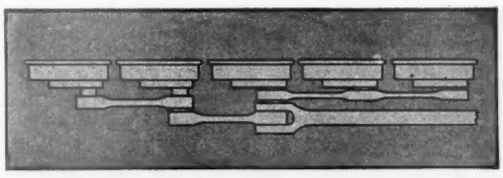
HALVE
the work of main pins and you
CUT DOWN
on repairs . . . .



The expense incident to the operation of a locomotive with the old style design above amounted to $0.012 per mile for material, $0.006 per mile for labor, or a total of $0.018 per mile for maintenance of rods and bushings. During the period of operation, the investment expense in the locomotive amounted to $0.238 per mile.



With Tandem Main Rod design, the expense incident to the operation amounted to $0.002 for material, $0.001 for labor, or a total of $0.003 per mile for maintenance of rods and bushings. During the period of operation, the investment expense in the locomotive amounted to $0.196 per mile.

Clearance limitations and other considerations have restricted the size of main pins while the forces they transmit have mounted steadily.

As a result the main pins are over-stressed and maintenance has been high.

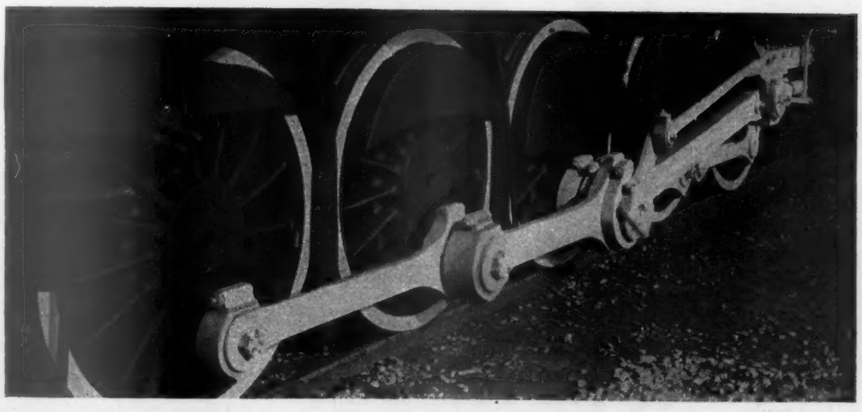
But the Tandem Main Rod Drive overcomes this over-stressing by dividing the piston thrust over two sets of main pins and axles.

This halving of work has reduced maintenance substantially.

On a large eastern railroad a full year's test showed that on 2-10-2 type locomotives the Tandem Main Rod Drive reduced the expense of maintaining rods and bushings from $0.018 per mile to $0.003, saving $0.015 per mile and reducing expense 83.3%.

Apply this percentage to your own cost and see what the Tandem Main Rod Drive would mean in your service.

FRANKLIN RAILWAY SUPPLY CO., INC.



NEW YORK
CHICAGO
MONTREAL

Conditioning Cars for Flour Loading

Northwest Car Men's Association.—Meeting held in the Minnesota Transfer Y. M. C. A. building, St. Paul, Monday evening, October 3. Paper entitled "Flour Loading," by O. W. Galloway, claim agent, Pillsbury Flour Mills. ¶In the course of this extensive and comprehensive discussion of the requirements for railway equipment to handling flour loading satisfactorily. Mr. Galloway covered many mechanical conditions of great interest to car men throughout the country. He described the entire operation of grain handling, flour manufacture and delivery of flour to destination. ¶Regarding the selection of proper cars, Mr. Galloway said: "In selecting equipment for the loading of grain products, a more rigid inspection is required than in selecting a car for grain. First, the car should be examined for leaks in the roof, which will permit water or cinders to enter, particularly at the corners and sides of the car, for if the sides of the car have nail holes which penetrate through them, if the car is in a rain storm for any length of time, water will enter and usually damage from one to five sacks. You can readily see what would happen on a car that was full of nail holes on the sides. These nail holes should be caulked with a caulking material, usually termed car cement, as when a car is permitted to load in this condition, we are running a hazard of a claim. Next it should be observed as to whether the doors fit tightly at the sides and the top, as a loose-fitting door will permit damage from cinders and dirt; also water. In examining the interior of the car, the floor should be smooth and free from protruding nails and bolts, particularly at the end where the king bolts or pins are, the plate should be countersunk and flush with the floor. On some equipment, insufficient bolts were used, permitting one edge of the board to warp upward, causing a sharp obstruction which damaged and tore sacks under the impact of the switch movement. Where bolts are applied to the floor, it is preferable to use a flat, round-headed bolt, and countersink so that it is flush. Where nails are used, they should be heavily-barbed nails or cement-coated, and should be driven perpendicularly, not at 85 or 90 deg. angle, as where nails are applied on an angle, the motion of the car will immediately pull the nails outward which will damage any commodity in paper cartons or jute sacks. The door posts should be flush with the side of the car, and false door posts usually installed for the nailing of grain doors should be taken out, as the false door posts, usually made of two by fours, narrow the car in the doorway four inches, and when a shift takes place and the load passes this narrow point, the results are that the ends of the sacks coming in contact with the door posts are cut off or torn out." ¶In cases of damage to lading, Mr. Galloway said: "Where cars do develop damage in transit, the agent, I believe, could almost 100 per cent eliminate a recurrence of such damage if he would report the true conditions of the cars, as to what caused the damage. For instance, if a car leaked cinders or water, had rough floor, splintered sides, or defective door posts, if these were reported immediately to the mechanical department and this car were not permitted to move under a load again until repaired, it would be a step in the direction of the elimination of claims. I am positive that this procedure is not followed out, as in the thousands of reports which I have personally handled, I have not seen a single instance where a report was made as to the defects of the car, or any suggestion made whereby a second loss could be reduced or prevented. These notations and reports at destination should be given to the consignee to accompany his claim to the shipper. These reports are very valuable to the shipper, as they give him an opportunity to correct and modify such items as can be directly attributed to the consignor. If a shipper does not receive these reports, he has no opportunity to correct the method of handling. A copy of the report should be sent directly to the proper railroad officials, in order that they also may take immediate steps to prevent a recurrence." ¶Mr. Galloway closed his paper with an earnest appeal to the shippers, transportation companies and the consignees, the complete cooperation of all three of which is essential to prevent the recurrence of damage and attendant damage claims which benefit no one and represent a preventable loss and tax upon industry.

Directory

The following list gives names of secretaries, dates of next or regular meetings and places of meeting of mechanical associations and railroad clubs:

AIR-BRAKE ASSOCIATION.—T. L. Burton, Room 5605 Grand Central Terminal Building, New York.

ALLIED RAILWAY SUPPLY ASSOCIATION.—F. W. Venton, Crane Company, Chicago.

AMERICAN RAILWAY ASSOCIATION.—Division V.—MECHANICAL.—V. R. Hawthorne, 59 East Van Buren street, Chicago.

DIVISION V.—EQUIPMENT PAINTING SECTION—V. R. Hawthorne, Chicago.

DIVISION VI.—PURCHASES AND STORES.—W. J. Farrell, 30 Vesey street, New York.

DIVISION I.—SAFETY SECTION.—J. C. Caviston, 30 Vesey street, New York.

DIVISION VIII.—CAR SERVICE DIVISION.—C. A. Buch, Seventeenth and H streets, Washington, D. C.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—G. G. Macina, 11402 Calumet avenue, Chicago.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. Thirty-ninth street, New York.

RAILROAD DIVISION.—Marion B. Richardson, associate editor, *Railway Mechanical Engineer*, 30 Church street

MACHINE SHOP PRACTICE DIVISION.—R. E. W. Harrison, 6373 Beechmont avenue, Mt. Washington, Cincinnati, Ohio.

MATERIALS HANDLING DIVISION.—M. W. Potts, Alvey-Ferguson Company, 1440 Broadway, New York.

OIL AND GAS POWER DIVISION.—Edgar J. Kates, 1350 Broadway, New York.

FUELS DIVISION.—W. G. Christy, Department of Health Regulation, Court House, Jersey City, N. J.

AMERICAN SOCIETY FOR STEEL TREATING.—W. H. Eiseman, 7016 Euclid avenue, Cleveland, Ohio.

AMERICAN SOCIETY FOR TESTING MATERIALS.—C. L. Warwick, 1315 Spruce street, Philadelphia, Pa.

AMERICAN WELDING SOCIETY.—Miss M. M. Kelly, 29 West Thirty-ninth street, New York.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Joseph A. Andrucetti, C. & N. W., Room 411, C. & N. W. Station, Chicago, Ill.

CANADIAN RAILWAY CLUB.—C. R. Crook, 2276 Wilson avenue, Montreal, Que. Regular meetings, second Monday of each month except in June, July and August at Windsor Hotel, Montreal, Que.

CAR DEPARTMENT OFFICERS ASSOCIATION.—A. S. Sternberg, master car builder, Belt Railway of Chicago.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—G. K. Oliver, 2514 West Fifty-fifth street, Chicago. Regular meetings, second Monday in each month except June, July and August, Auditorium Hotel, Chicago, Ill.

CAR FOREMEN'S ASSOCIATION OF OMAHA, Council Bluffs and South Omaha Interchange.—Geo. Kriegler, car foreman, Chicago, Burlington & Quincy, Sixteenth avenue and Sixth street, Council Bluffs, Iowa. Regular meetings, second Thursday of each month at Council Bluffs.

CENTRAL RAILWAY CLUB OF BUFFALO.—M. D. Reed, Room 1817, Hotel Statler, Buffalo, N. Y. Regular meeting, second Thursday each month, except June, July and August, at Hotel Statler, Buffalo.

CINCINNATI RAILWAY CLUB.—D. R. Boyd, 2920 Utopia Place, Hyde Park, Cincinnati. Regular meeting, second Tuesday, February, May, September and November.

CLEVELAND RAILWAY CLUB.—F. B. Frericks, 14416 Alder avenue, Cleveland, Ohio. Meeting second Monday each month, except June, July and August, at the Auditorium, Brotherhood of Railroad Trainmen's building, West Ninth and Superior avenue, Cleveland.

EASTERN CAR FOREMEN'S ASSOCIATION.—E. L. Brown, care of the Baltimore & Ohio, Staten Island, N. Y. Regular meetings, fourth Friday of each month, except June, July, August and September.

INDIANAPOLIS CAR INSPECTION ASSOCIATION.—P. M. Pursian, chief clerk to superintendent of shops. C. C. C. & St. L., Beech Grove, Ind. Regular meetings first Monday of each month, except July, August and September, at Hotel Severin, Indianapolis, at 7 p. m. Noon-day luncheon,, 12:15 p. m. for Executive Committee and men interested in the car department.

INTERNATIONAL RAILROAD MASTER BLACKSMITH'S ASSOCIATION.—W. J. Mayer, Michigan Central, 2347 Clark avenue, Detroit, Mich.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—T. D. Smith, 1660 Old Colony building, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—William Hall, 1061 W. Wabasha street, Winona, Minn.

MASTER BOILERMAKER'S ASSOCIATION.—A. F. Stiglmeier, secretary, 29 Parkwood street, Albany, N. Y.

NATIONAL SAFETY COUNCIL—STEAM RAILROAD SECTION.—W. A. Booth, Canadian National, Montreal, Que.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic avenue, Boston, Mass. Regular meeting, second Tuesday in each month, excepting June, July, August and September, Hotel Statler, Boston.

NEW YORK RAILROAD CLUB.—D. W. Pye, Room 527, 30 Church street, New York. Meetings, third Friday in each month, except June, July and August, at 29 West Thirty-ninth street, New York.

NORTHWEST CAR MEN'S ASSOCIATION.—E. N. Myers, chief interchange inspector, Minnesota Transfer Railway, St. Paul, Minn. Meeting first Monday each month, except June, July and August, at Minnesota Transfer Y. M. C. A. Gymnasium building, St. Paul.

PACIFIC RAILWAY CLUB.—W. S. Wollner, P. O. Box 3275, San Francisco, Cal. Regular meetings, second Thursday of each month in San Francisco and Oakland, Cal., alternately.

RAILWAY BUSINESS ASSOCIATION.—P. H. Middleton (Treas. and Asst. Sec.), First National Bank building, Chicago.

RAILWAY CAR MEN'S CLUB OF PEORIA AND PEKIN.—C. L. Roberts, R. F. D. 5, Peoria, Ill.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, 1841 Oliver building, Pittsburgh, Pa. Regular meeting fourth Thursday in month, except June, July and August, Ft. Pitt Hotel, Pittsburgh, Pa.

RAILWAY FIRE PROTECTION ASSOCIATION.—R. R. Hackett, Baltimore & Ohio, Baltimore, Md.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.—J. D. Conway, 1841 Oliver building, Pittsburgh, Pa. Meets with Mechanical Division and Purchases and Stores Division, American Railway Association.

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.—A. T. Miller, P. O. Box 1205, Atlanta, Ga. Regular meetings third Thursday in January, March, May, July, September and November. Annual meeting, third Thursday in November, Ansley Hotel, Atlanta, Ga.

SUPPLY MEN'S ASSOCIATION.—E. H. Hancock, treasurer, Louisville Varnish Company, Louisville, Ky. Meets with Equipment Painting Section, Mechanical Division American Railway Association.

TORONTO RAILWAY CLUB.—N. A. Walford, district supervisor car service, Canadian National, Toronto, Ont. Meetings first Friday of each month except June, July and August.

TRAVELING ENGINEER'S ASSOCIATION.—W. O. Thompson, 1177 East Ninety-eighth street, Cleveland, Ohio.

WESTERN RAILWAY CLUB.—J. H. Nash, 1101 Peoples Gas building, Chicago. Regular meetings third Monday in each month except June, July, August and September.

(Turn to next left-hand page)

MODERN POWER MEETS PRESENT-DAY DEMANDS

Higher Speeds, Heavier Trains and Longer Runs—these demands are being imposed on locomotives today, and the older power is failing to meet them economically.

Modern Transportation Requirements demand Modern Motive Power—big-boilered, high-wheeled locomotives, designed and equipped for the special conditions to be met, and developing maximum power output per ton of locomotive weight.

Such locomotives, wherever used, are demonstrating that—

It takes Modern Locomotives to make money these days!

THE BALDWIN LOCOMOTIVE WORKS
PHILADELPHIA

NEWS

THE CINCINNATI UNION TERMINAL has awarded a contract for the installation of direct steaming and boiler washing equipment at its engine-house at Cincinnati, Ohio, to the Railway Engineering Equipment Company, Chicago, at a cost of $48,000.

Increases in Shop Employment

MORE THAN 300 additional men are to be given employment on the Minneapolis & St. Louis on a program involving the dismantling and scrapping of 21 locomotives, 1,606 freight cars, 35 passenger coaches and 42 work cars, which will require an expenditure of $35,000. Authority for this work, which will commence on December 12, has been authorized by the United States District Court at Minneapolis, Minn., the M. & St. L. being in receivership.

Fifteen hundred additional men have been employed five days a week in the New York Central's car shops at East Buffalo, N. Y. and Indianapolis, (Beech Groove) Ind., since December 1. Of the three plans suggested in its application to the Reconstruction Finance Corporation for a loan of $2,500,000 to increase employment, the railroad has selected that one which calls for repairing 10,000 of its 50- and 55-ton steel box cars and 3,000 automobile box cars. The program is tentative and if conditions require, part of the money may be diverted to other uses, such as repairing locomotives. The program adopted will provide work also for 1,000 other men for five months in factories that supply materials used in making the repairs. The loan is to be advanced in monthly installments of $350,000.

The Angus Shops of the Canadian Pacific and other large shops of the system reopened the latter part of November.

"Under this arrangement," according to an announcement made on November 23, "approximately 8,000 men will be employed by the company, including those at Angus Shops, Montreal; McAdam, Carleton Place, Toronto, North Bay, Winnipeg, Calgary and Vancouver."

D. L. & W. To Convert Four Locomotives

THE DELAWARE, LACKAWANNA & WESTERN has arranged to convert four light fast-freight locomotives to modern high-power switchers at its locomotive shops, Scranton, Pa. This work will be in addition to the regular repair and maintenance work which the shops are called upon to perform. The necessary frames, wheel centers and driving-boxes, aggregating some 90,000 lb. of cast steel, and driving-wheel axles and tires, approximating 45,500 lb. of wrought steel, are being contracted for and the work of converting these locomotives will get under way as soon as these parts can be fabricated and delivered. Some 3,425 man-days of eight hours each are involved and it will be about four months before the last locomotive will be turned out of the shops. When completed, it is expected that these switchers which will be of the 0-8-0 type, will be placed in service on the Scranton division.

Interchange of Cars Equipped with Experimental Brake

BASED on the results of the American Railway Association power-brake investigation, the Westinghouse Air Brake Company and the New York Air Brake Company have submitted a new Type-AB freight brake equipment, which promises important improvements over the present standard brake in application and release functions. It is also designed to reduce ordinary maintenance costs and provide for such modification as to restore its characteristics to that of the present brake, if found necessary. To determine the merits of the new brake for general service and ascertain to what degree it will prove effective in reducing maintenance costs, arrangements have been made for the application of the Type-AB brake to a considerable number of cars.

To facilitate interchange of cars equipped with the new brake, the American Railway Association, Mechanical Division, has recently authorized the addition of a new note under Par. 3, Sec. A, of Interchange Rule 3, as follows: "Note: Cars equipped with the new experimental design of air-brake equipment, designated as 'AB' and stenciled 'AB brake experimental,' will be accepted in interchange on or after November 15, 1932." The General Committee, in Circular No. D.V.-793, requests that appropriate instructions be issued on each road to permit the free interchange of cars equipped with the experimental "AB" air brake.

Report of Car Service Division, A. R. A.

AS A RESULT of a gradual reduction in recent years in the amount of rolling stock owned, the railroads of this country now have fewer freight cars and locomotives than at any time in the past decade, according to the annual report of the Car Service Division, American Railway Association.

"The reduction," said M. J. Gormley, chairman of the division, in submitting the report, "in ownership of freight cars and locomotives has been made possible by the modernization of existing railway equipment. This, together with the fact that the handling of freight traffic has been expedited and operating efficiency greatly improved in recent years, has resulted in a constant improvement of service to the public.

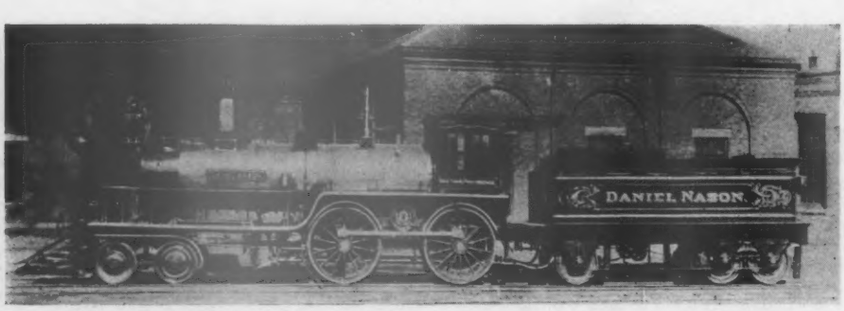
"Freight cars owned by the railroads of this country now total 2,141,647 cars, a reduction of 223,025 cars or 9.4 per cent compared with the number owned in 1925, when the ownership was the highest on record. The average capacity of freight cars today, however, is 47.07 tons, an increase of nearly two and one-half tons since 1925 and an increase of 3.71 tons in the past ten years.

"Ownership of locomotives on October 1, 1932, totaled 52,936, a reduction of 12,135 or 18.6 per cent compared with the number owned in 1924, which marked the highest number on record in any one year. At the same time, there has been an increase of 16.4 per cent in the tractive power of locomotives and for the ten year period, an increase of 19.4 per cent."

Regarding freight traffic this year, Mr. Gormley said:

"Due to the movement of crops and fuel, together with some greater stimulation in business activity, there has been an improvement in freight traffic this fall compared with earlier months. Beginning with the week ended on August 6, when 496,033 cars were loaded with revenue freight, there was a steady increase up to the week ended on October 15, when 650,578 cars were loaded. This was an increase of 31.2 per cent compared with the week of August 6. In 1931 for the same period, there was an increase of only 5.9 per cent,

* * *



From Collection of George M. Sittig

Boston & Providence 4-4-0 type locomotive "Daniel Nason"

and in 1930, an increase of only 8.9 per cent. For the same period in 1921, the increase was 22.7 per cent. These comparisons show there has been a greater percentage of increase for this period in 1932 than ordinarily occurred in previous years."

Substitution of Type-E Knuckles

THE A. R. R., Mechanical Division, has recently authorized the substitution of the Type-E coupler knuckle with the 9-in. face for repairs to the Type-D coupler, at no increase in cost to the purchaser, and with a number of attendant advantages.

The Type-E knuckle, by means of the projecting shelf at its locking face, will support the lock in an upright position, thus eliminating the contact and wear between the top front face of the lock and the inner front face of the bar. This difference in supporting the lock will also improve lifting the lock for coupler operation.

By the same means of improving the support for the Type-D lock, it will be impossible for the "D" top-lock lifter to become locked beneath the anti-creep lug when "D" couplers are fitted for top operation.

The "E" kunckle applied to the "D" coupler provides a more positive anti-creep feature, whether the coupler is fitted for top or bottom standard or for rotary bottom operation.

Laboratory tests have proven that the "E" knuckle is stronger than the "D" knuckle. This improvement is partially the result of the better support of the "E" knuckle, due to the improved locking condition.

The General Committee has authorized the manufacturers to scrap the patterns and core boxes for the Type-D knuckle and to fill any requisitions for 9-in. face Type-D knuckles with the 9-in. face Type-E knuckles at the same price as the 9-in. face Type-D knuckles.

This action in no way affects the standard 11-in. face "E" knuckle which is standard with the Type-E coupler and only applies to replacing 9-in. face "D" knuckle with the 9-in. face "E" knuckle for repairs to Type-D couplers.

Results of Mechanical Division 1932 Letter Ballot

AT THE session of the American Railway Association, Mechanical Division, held in Chicago, June 23 and 24, 1932, the recommendations from various committees were ordered submitted to a letter ballot of the members. These recommendations, totaling 45 in number, to amend the standard and recommended practice of the division, were approved, effective March 1, 1933, except proposition No. 5 covering recommended practice for the standardization of 300-lb. globe and angle valves for steam locomotives, the effective dates for which will be recommended by the Committee on Locomotive Construction in its report at the 1933 annual meeting. Also, the recommendations to amend the loading rules of the division were approved, effective January 1, 1933.

The detailed results of the letter ballot are covered in Mechanical Division circular No. D.V.-792, which shows favorable action regarding recommendations of the various committees, as follows:

Electric Rolling Stock.—(1) On the proposition to adopt a standard system of nomenclature for axle and truck arrangement of electric locomotives and internal-combustion engine locomotives having electric transmission

Specifications for Materials.—(2) On the proposition to revise the recommended practice specifications for heat-treated carbon-steel helical springs

(3) On the proposition to substitute recommended practice specifications for unions, combustion union fittings and screwed pipe fittings, black and galvanized, for 300-lb. pressure for the present recommended practice specifications for unions and combination union fittings, black and galvanized for 300-lb. pressure

(4) On the proposition to revise Sec. 2, tension tests of recommended practice specifications for malleable iron castings

Locomotive Construction.—(5) On the proposition to adopt as recommended practice, standardization of 300-lb. globe and angle valves for steam locomotives. (Note: Since the above recommendation for standardization of globe and angle valves for 300-lb. pressure was submitted to letter ballot, the committee has further checked the drawings and dimensions and finds that a number of errors exist. Arrangements have, therefore, been made to lay out each size of both valves to full size and carefully recheck all of the dimensions. It is expected that this work will be completed in time to be included in the 1933 report of the committee, at which time recommendation will be made as to the effective date for this recommended practice.)

Loading Rules.—(6) On the proposition to revise tables in Loading Rule 13

(7) On the proposition to revise tables in Loading Rule 23

(8) On the proposition to revise cuts and tables in Loading Rule 30

(9) On the proposition to revise Loading Rule 138

(10) On the proposition to adopt new Loading Rule 141 B

(11) On the proposition to revise the first sentence of Loading Rule 201

(12) On the proposition to revise Loading Rule 214

(13) On the proposition to revise the third sentence of Loading Rule 217

(14) On the proposition to revise the second sentence of the first paragraph of Loading Rule 224

(15) On the proposition to revise the last sentence of Loading Rule 228 and eliminate the second sentence of note under this rule

(16) On the proposition to revise the list of material shown on page 182 of the loading rules under Loading Rule 238

(17) On the proposition to revise Loading Rule 249

(18) On the proposition to add a new paragraph to Loading Rule 250-A

(19) On the proposition to revise Loading Rule 259

(20) On the proposition to revise Fig. 87 under Loading Rule 262

(21) On the proposition to revise Loading Rule 302

(22) On the proposition to revise Loading Rule 302 A

(23) On the proposition to revise Fig. 104 under Loading Rule 305

(24) On the proposition to revise Sec. (a) of Loading Rule 306

Wheels.—(25) On the proposition to revise the recommended practice specifications for cast iron wheels

(26) On the proposition to adopt tread and flange contour shown as Fig. 5 in Circular D.V.-778, as standard for all standard multiple-wear wrought steel and steel-tired wheels

(27) On the proposition to revise the recommended practice symbols for marking defective cast iron and cast steel wheels

(28) On the proposition to revise the recommended practice symbols for marking defective wrought steel and steel-tired wheels

Couplers and Draft Gears.—(29) On the proposition to revise the recommended practice specification for separate followers for draft gears

(30) On the proposition to permit reclamation of cracked cast steel coupler yokes by welding within specified limits

(31) On the proposition to advance the recommended practice specifications for coupler yokes to standard

(32) On the proposition to approve the 1-inch-diameter hair-pin draft-key retainer as an alternate for the present A. R. A. retainer

Car Construction.—(33) On the proposition to adopt new designs for C, D and H springs, as recommended practice in place of present springs C, D and H, and to withdraw from the Manual tentative designs of springs L, M, N, O and P

(34) On the proposition to revise the design of standard journal boxes C, D, E and F

(35) On the proposition to revise the standard specifications for journal-box lids

(36) On the proposition to adopt as standard, specifications for relined journal bearings, including necessary modifications in the interchange rules

(37) On the proposition to change heading for table shown on page 24A, Section D, Manual of Standard and Recommended Practice

(38) On the proposition to adopt as recommended practice designating letters and definition for refrigerator car designed primarily for transportation of solid carbon dioxide

(39) On the proposition to revise the recommended practice definition for "BH" cars.

(40) On the proposition to adopt designs and specifications for standard steel-sheathed wood lined box car

Brakes and Brake Equipment.—(41) On the proposition to substitute for the sketch and text now shown on page 3, Section E, Manual of Standard and Recommended Practice, the four dimensioned sketches illustrating designs and application of non-patented supports, designated as Plan 1, 2, 3 and 4 in Circular D. V. 770.

(42) On the proposition to adopt recommended practice for air-brake piping

(43) On the proposition to adopt recommended practice for location of emergency valve and car discharge valve on cars having observation platforms

(44) On the proposition to revise the test code for triple valves

(45) On the proposition to adopt as standard the retaining valve cup described in report of the committee to the 1928 annual meeting.

Supply Trade Notes

HUGH BENET, since 1927, manager of the Holyoke, Mass., works of the Worthington Pump & Machinery Corporation, has been appointed manager of its Harrison, N. J., works.

T. R. WYLES, until recently vice-president and chairman of the board of the Detroit Graphite Company, Detroit, Mich., has become associated with the Armstrong Paint & Varnish Works, Chicago.

GEORGE M. SHARER, who has been connected with the Link-Belt Company of Philadelphia, Pa., in various capacities for the past 32 years, has been appointed sales manager of its eastern division, with headquarters at Philadelphia. In this capacity, he has direct supervision of sales of all of the company's offices in the Atlantic Coast states.

GEORGE B. ALLISON, supply manufacturers' representative, 50 Church street, New York, has been appointed representative in the eastern territory for the Indestructo Glass Corporation, Farmingdale, Long Island, N. Y., manufacturers of laminated glass.

THE WHITCOMB LOCOMOTIVE COMPANY, Rochelle, Ill., a subsidiary of the Baldwin Locomotive Works, has acquired the business, inventory and good-will of the Milwaukee Locomotive Manufacturing Company, Milwaukee, Wis., a subsidiary of the Westinghouse Air Brake Company.

THE MORRISON METALWELD PROCESS, INC., Buffalo, N. Y., welding engineers and contractors, specializing in railway track and bridge repairs, has established a New York office at 30 Church street, with

(*Turn to second left-hand page*)

QUALITY ALL WAYS
QUALITY ALWAYS

ECONOMICAL

because

It's much cheaper for a railroad to buy Alco Forgings than to equip, maintain and operate shops to manufacture them.

INSURE MAXIMUM TON-MILES FOR THE FEWEST MAINTENANCE DOLLARS—

THAT means economy. Their great strength and durability give maximum insurance against the engine failures which jeopardize earning power and pile up maintenance expense—that means more economy plus safety.

Dependable locomotive performance is so important that there should be no compromise with quality in locomotive forgings. And there are no short cuts to high quality.

The manufacture of quality forgings involves a series of necessary scientific operations. Each must be carefully executed under technical control and properly correlated for best results.

ALCO quality forgings are made from billets which must pass rigid tests for chemical properties and physical soundness. High carbon steels are subjected to a tensile test and alloy steels to a full section macroscopic test. The billets are properly preheated before forging, using indicating and recording pyrometers to eliminate guesswork and the human element. The forgings are formed on presses and hammers of sufficient capacity to insure proper penetration well into the mass. The forgings are then heat-treated, again under pyrometer control, to insure the best in grain refinement and the highest ductility with the desired tensile strength.

Experience proves that these forgings stand up under the severe stresses of hard service.

American Locomotive Company

30 Church Street New York N.Y.

Pearce P. Williams and James Isaacs as district representatives. Offices have likewise been established in the McLachlen building, Washington, D. C., with J. R. Forney as district sales engineer, and The Howard P. Cook Company, Bridgeport, Conn., have been appointed to represent the company in the New England district. George J Slibeck, formerly sales engineer with the Pettibone Mulliken Company is now associated with Morrison Metalweld Process, Inc., in the same capacity, at its Chicago headquarters.

R. E. Robillard

THE FRIGIDAIRE CORPORATION, Dayton, Ohio, refrigeration subsidiary of General Motors, has entered the railway-equipment field with the introduction of complete air-conditioning equipment for sleeping cars, club and observation cars, diners and day coaches. The new air-conditioning equipment, according to E. G. Biechler, president and general manager, is a joint development of the General Motors Research Laboratories in Detroit, Mich., and Frigidaire's Engineering Division in Dayton. A separate factory division has been established in Dayton for the new sales and engineering. This unit will be known as the Railway Air-Conditioning Division. R. E. Robillard, air-conditioning application engineer, heads the division as railway contract representative. The research and engineering activity is in charge of C. F. Henney, a member of the staff of E. B. Newill, vice-president in charge of engineering of the Frigidaire Corporation.

THOMAS P. MCGINNIS, formerly district sales manager of the Pyle-National Company, is now manufacturers' agent at 604 Chamber of Commerce building, Pittsburgh, Pa., for the Pyle-National Company, Chicago, the Locomotive Finished Material Company, Atchison, Kan., the Argyle Railway Supply Company, Chicago, Ill., and E. W. Carran & Sons Company, Covington, Ky. Mr. McGinnis entered railway service in 1908 as special appprentice on the Minneapolis, St. Paul & Sault Ste. Marie. Later he served his time as machinist apprentice on the St. Louis-San Francisco, specializing in gas-electric motor cars. Subsequently he was employed by the Locomotive Finished Material Company, the Dan Patch Lines and the Southern Pacific, during which period he continued to devote a major part of his time to motor car work. He entered the employment of the Pyle-National Company in 1916, serving respectively as representative and district sales manager, until July, 1932.

Obituary

DELMAR W. CALL, who was formerly in charge of sales at New York for the American Steel Foundries with the title of assistant to the president, died at Battle Creek, Mich., on November 20, at the age of 62 years.

Personal Mention

Master Mechanics and Road Foremen

A. R. RUITER has been appointed master mechanic of the Pan Handle-Indiana Territory division of the Chicago, Rock Island & Pacific, with headquarters at Shawnee, Okla. In the November issue of the *Railway Mechanical Engineer* it was incorrectly stated that Mr. Ruiter had been appointed general foreman in the locomotive department at Shawnee. Mr. Ruiter was formerly master mechanic at Armourdale, Kan.

Obituary

WILLIAM HUDSON, shop superintendent of the Pere Marquette, who died on October 2, was born on October 29, 1875, at Westmoreland, England. He came to this country when a young man and was employed from 1900 to 1903 as a machinist

W. Hudson

on the Iron Mountain at Little Rock, Ark. In 1904 he became a pit foreman at the Wyoming shops of the Pere Marquette at Grand Rapids, Mich.; in 1906, a machinist on the Kansas City Southern at Pittsburg, Kan.; in 1912, an inspector for the Smith Hub Plate Company at Schenectady, N. Y.; in 1913, enginehouse foreman of the Missouri, Kansas & Texas at Osage, Okla.; and in 1915, general foreman of the M. K. & T. at Denison, Tex. He became shop superintendent of the Pere Marquette at Grand Rapids, on May 1, 1917.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers. State the name and number of the bulletin or catalog desired, when mentioned in the description.

COMPARISON CHART.—A valve chart, comparing OIC catalog figure numbers with those of other valve manufacturers, has been prepared by the Ohio Injector Company, Wadsworth, Ohio.

VALVES AND SPECIALTIES.—The Lunkenheimer Company, Cincinnati, Ohio, has issued a 20-page illustrated booklet descriptive of Lunkenheimer valves and specialties for railroad service.

CYLINDER COCKS AND VALVES.—Catalog 500, issued by the George Manufacturing Company, Philadelphia, Pa., describes and illustrates automatic cylinder cocks, automatic drain valves, and automatic drain and relief valves for railroads, industrial and marine uses.

INDUSTRIAL RUBBER GOODS.—The B. F. Goodrich Rubber Company, Akron, Ohio, gives in its 24-page catalog engineering data and information on its principal industrial rubber goods, such as transmission belting, conveyor belts, hose, etc.

ROLLER-BEARINGS.—Bulletin 100, issued by the Hyatt Roller Bearing Company, Newark, N. J., gives dimensions and load-rating tables of Hyatt roller bearings and their application. The bulletin is divided into four sections, covering wound roller-type bearings, solid roller-type bearings, single row radial bearings, and lubrication data. Elements of bearing design, selection, load computation, correct assembly, etc., are also discussed.

VANADIUM SPECIFICATIONS. — The Vanadium Corporation of America, 120 Broadway, New York, has issued new specifications covering high-test carbon-vanadium cast steel for locomotive and other castings; silicon-vanadium steel bars for railway springs; helical springs of silicon-vanadium steel for railways; chrome-vanadium steel bars for railway springs, and elliptic springs of chrome-vanadium steel for railways. These specifications are available in bulletins 3B, 4B, 5B, 6B, and 7B, respectively.

CONDENSED CATALOG. — Illustrated descriptions of the design, construction and operating characteristics of its principal products for power, industrial and process plants are described in the latest catalog of the Babcock & Wilcox Company, 85 Liberty street, New York. A 16-page bulletin, entitled "Four to Six Percent Chromium Steel Tubes and Pipe," presents the advantages, uses, and chemical and physical characteristics of four to six per cent chromium steel tubes and pipe for refinery and other services. Data are also given on four to six per cent chromium steel with tungsten and molybdenum.

TESTED DAILY

in a thousand shops of a hundred trades

Willson LJ50 light weight, metal cup goggle

The Willson LJ50 all-purpose goggle is in use on eye hazardous operations in practically all trades requiring eye protection. Over a period of ten years, it has been developed to meet the most exacting demands of the workmen who wear it and the employers who buy it.

Industrial management recognizes in LJ50 a goggle which is wholly satisfactory to the workman, does a good eye protection job economically — it is reasonably priced, long wearing and all parts are readily replaceable — and helps confine compensation costs and lost time expenses to a low figure.

The workmen like it because it is comfortable, shaped to fit the bone structure of the face and its Willson Super-tough lenses are free from distortion and do not draw the eyes or cause headaches.

Is there a "crank" on goggles in your shops—why not let him try LJ50? Order a pair or two "on suspicion" and let several of your men try them. Convince yourself that such features as found in LJ50 mean a lot to goggle wearers.

Here are a few of the reasons workmen like the Willson LJ50

Wide Undistorted Vision
. . . thru 50 mm. (2" diameter) Willson Super-tough lenses

Cushioned Comfort
. . . shallow cups edged with Willson sweat-proof padding

Anatomically Shaped
. . . to conform to the bone structure of the face

Well Ventilated
. . . to prevent fogging lenses at most any job

Light Weight
. . . yet strong enough to withstand unusual impact

Economical
. . . all parts easily replaceable. Price: $1.65 each, f. o. b. shipping point.

Willson manufactures a complete line of composition cup and spectacle type goggles, welding masks, sandblast helmets and respirators.

WILLSON PRODUCTS, Inc.
READING, PA.

Represented in 13 western states by E. D. Bullard Co., 275 Eighth Street, San Francisco, with conveniently located branch depots.

Complete AIR CONDITIONING from rail

WESTINGHOUSE, for 50 years a builder of railway apparatus, now offers you a complete line of air conditioning equipment that has been designed specifically for railway passenger car service. This equipment assures forced dehumidification, the most essential requirement of proper air conditioning under stifling conditions of high humidity and temperatures.

This equipment includes generating, refrigerating, air conditioning and control units . . . all designed as parts of a complete system, to facilitate installation and maintenance, and to produce a final result—air conditioning—that is reliable and efficient. Illustrated here are the four major units of which this equipment consists.

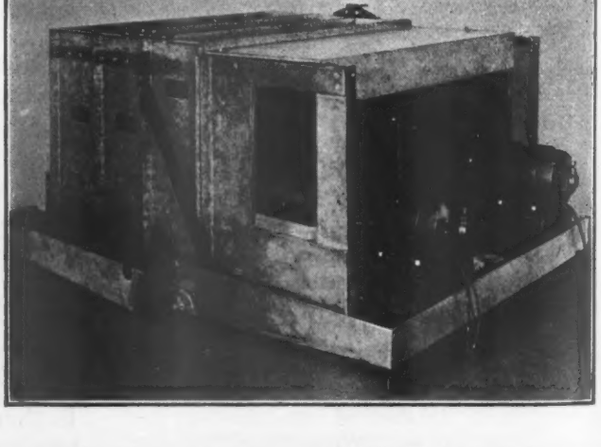
GENERATING

Ample Capacity in the generator provides the excess power required to assure forced dehumidification and other passenger car power requirements. This generator is a 32-45 volt machine having a continuous rating of 15-kw.

Long battery life is insured because the generator has a flat voltage characteristic combined with the very desirable "taper charge" feature.

Reliable Silent gear drive eliminates all belts, spline shafts and universal joints. The gears have helical teeth, are flexibly coupled, run in a bath of oil, and will meet the severest requirements of railway service.

This unit is applicable to either four or six wheel trucks.



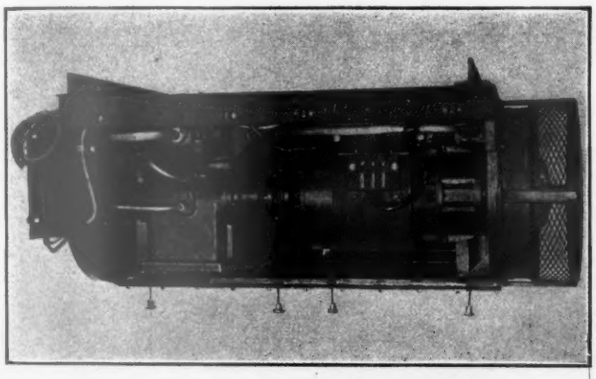
AIR CONDITIONING

Easy installation of the air conditioning equipment under the car roof has been insured because cooling coils, blowers, and refrigerant expansion regulators are assembled as a unit.

A high-pressure line runs from the refrigerating unit to the expansion regulators, and from these the refrigerant is distributed to the cooling coils.

G EQUIPMENT
l to roof

Air at the rate of 2500 cu. ft. per minute is delivered to the car by fans which pull the air through filters and the cooling coils.



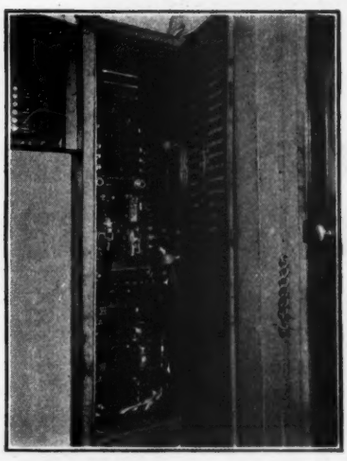
REFRIGERATING

One compact unit enclosed in a box furnishes refrigeration. In this box are a high-speed 6-ton compressor providing ample capacity for forced dehumidification, a combination a-c.–d-c. motor, fan, liquid receiver, oil separator, shut-off valves, and a-c. starter.

Accessibility has been provided by suspending the entire refrigerating unit from a frame forming the top of the box and bolting to the under side of the car floor. The bottom and sides of the box are therefore removable exposing all parts.

The adoption of a combination a-c.–d-c. motor solves the problem of pre-cooling cars at yards or terminals. The compressor may be plugged in on an a-c. power source and without changing connections, the d-c. end of the motor automatically performs as a generator for battery charging.

T 79400



CONTROL

Generator and motor control panels are arranged for placing in existing lighting control cabinets, and an adjustable thermostat controls the air conditioning apparatus and assures forced dehumidification when required whether operation is from the battery, the generator, or an a-c. power source.

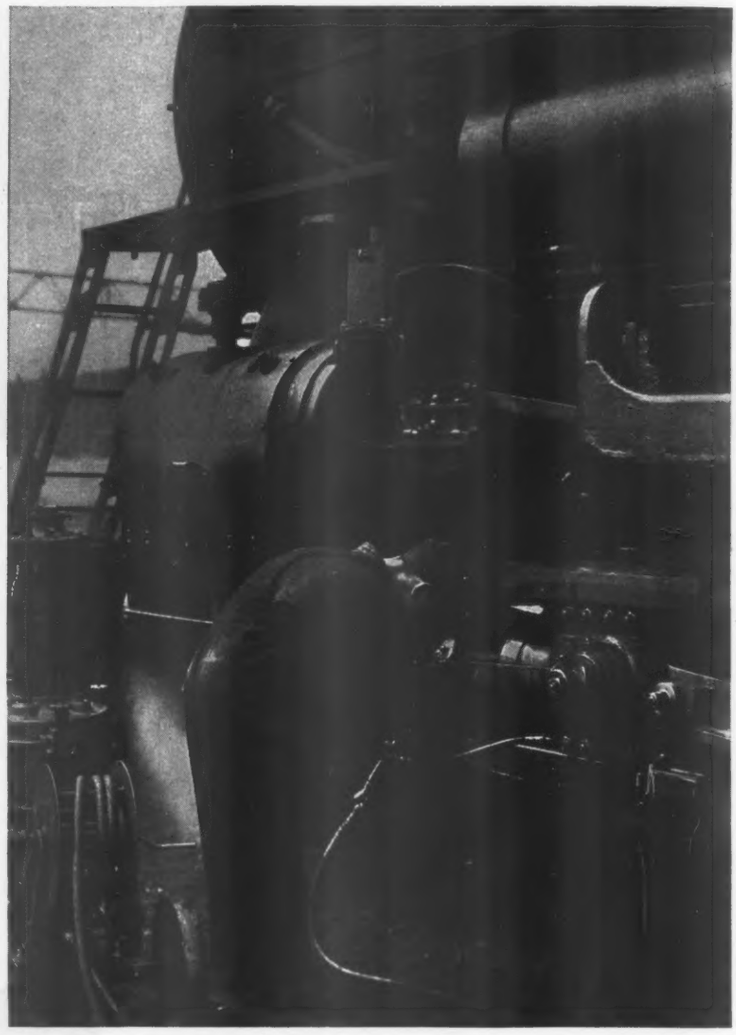
◆

Westinghouse air conditioning equipment gives you reliable final results. Responsibility rests with a single manufacturer.

Our engineers will be glad to discuss air conditioning with you. Call our nearest office.

Westinghouse

Quality workmanship guarantees every Westinghouse product



ARE YOU USING HIGH PRESSURE LUBRICATION?

HIGH pressure locomotive lubrication presents new and sometimes difficult lubrication problems.

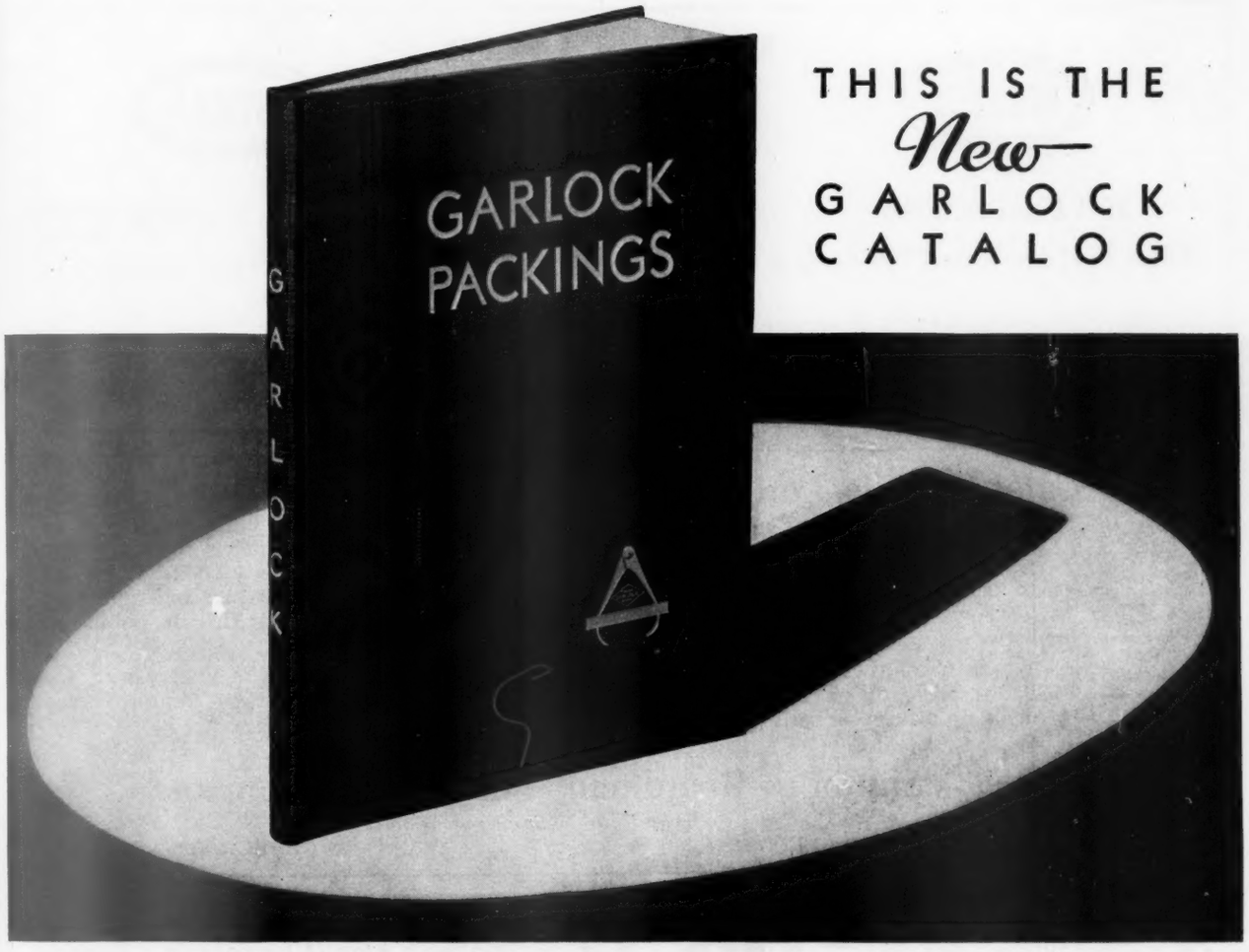
Lubricants for locomotive high pressure lubricating systems must have distinct and unusual qualities. They must perform effectively over a wide range of temperatures and must not thin out and run off under heat. They must give effective and sustained lubrication to all parts that formerly had excessive wear, such as shoes, wedges, guides, hub faces on driving boxes, valve gear, link blocks, link supports, brake hangers and spring rigging.

Stanolind Locomotive Pressure Grease meets these lubrication requirements. It stands up under long runs and severe service. It effectively lubricates those two sources of lubrication trouble—valve cross heads and link blocks. Stanolind Locomotive Pressure Grease dispenses easily even at temperatures as low as 10°F., which requires the use of only one grade of grease the year around.

Stanolind Locomotive Pressure Grease has been severely and thoroughly tested on three major trunk lines and proved very satisfactory in all tyes of service. Our engineers will be glad to submit evidence from these tests and give you complete information.

STANDARD OIL COMPANY
(Indiana)
910 South Michigan Avenue Chicago, Illinois
1007-A

STANOLIND LOCOMOTIVE PRESSURE GREASE
A STANDARD OIL PRODUCT



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"The House of Transportation"

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An Autographed Copy of "THE 17" Makes a Fine Christmas Present

By EDWIN C. WASHBURN

Mr. Washburn, the son of the builder and first president of the Soo Line, will autograph a copy of his book, "The 17", for those who wish to give a copy as a Christmas present. Any old timer, particularly if he has railroaded in the Northwest, will enjoy reading this book. The author writes of these early days from personal experience and illustrates the story of this famous engine with rare photographs of romantic episodes in its history.

Much unwritten history of the northwestern railroading after the Civil War is contained in this book. In those days locomotives, each with an individual name, were regarded as characters and in this spirit Mr. Washburn lets "The 17", a Baldwin eight-wheeler, tell its own story and exchange stories with others. One of them describes the great Hinckley fire in which engines raced through burning forests to save pioneer settlers.

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Reviewers' Opinions

"'The 17' is a dramatically successful novel. Mr. Washburn's research has been enormous, and his enthusiasm for the history of railroading in the days following the Civil War is engaging and even contagious."—*New York Times.*

"A glowing story of pioneer days on various Western railroads."—*Hartford Courant.*

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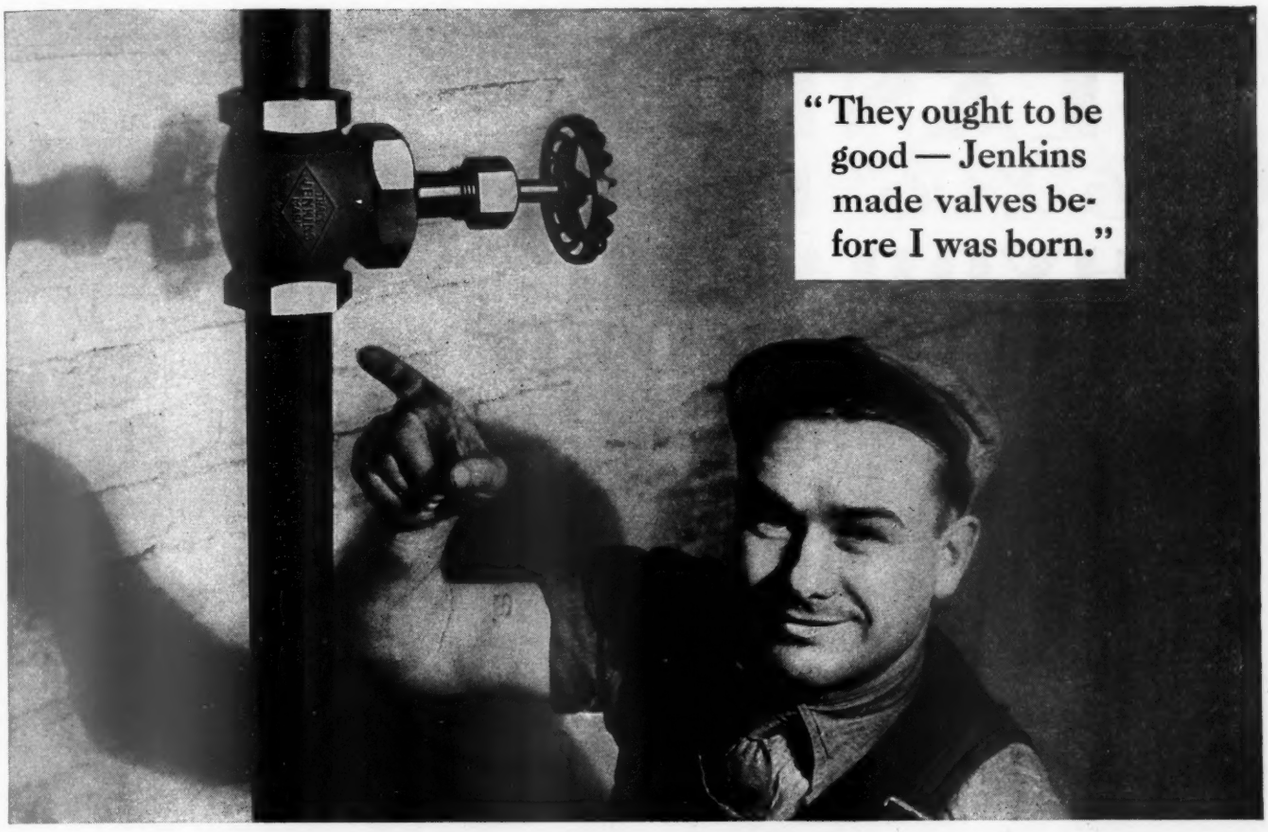
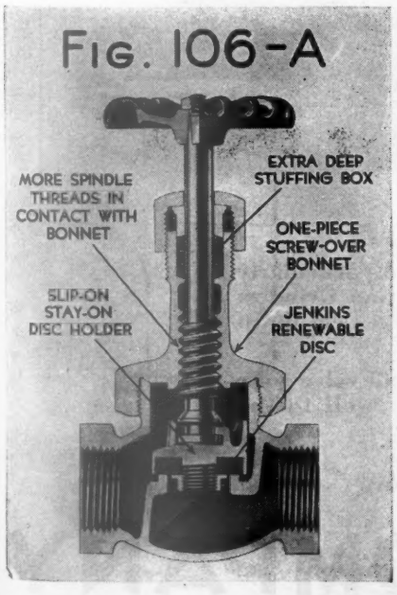
"Nearly all of the things you referred to I knew about personally. Your story of 'The 17' gives much valuable and illuminating information."—Daniel Willard, *President of the Baltimore and Ohio.*

300 pages, 25 illustrations, 5½ x 7 inches, cloth, $2.50



Product of 68 years' valve experience

. . . check these money-saving features



You can quickly see that from wheel nut to pipe threads this Fig. 106-A Jenkins is built to save money in installation, maintenance, service.

Look at the sectional view. There's the deep stuffing box that holds more packing; the screw-over bonnet made in a single solid piece for long life and speedy removal; the unique slip-on stay-on disc holder that is a big time-saver; other features that offer new advantages for valve users.

We've put our 68 years of valve making experience into this fine valve. Ask your supply house to show you the Fig. 106-A Jenkins Bronze Globe Valve or write for Bulletin 141. Made also in angle, cross and check patterns.

JENKINS BROS.

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Since 1864

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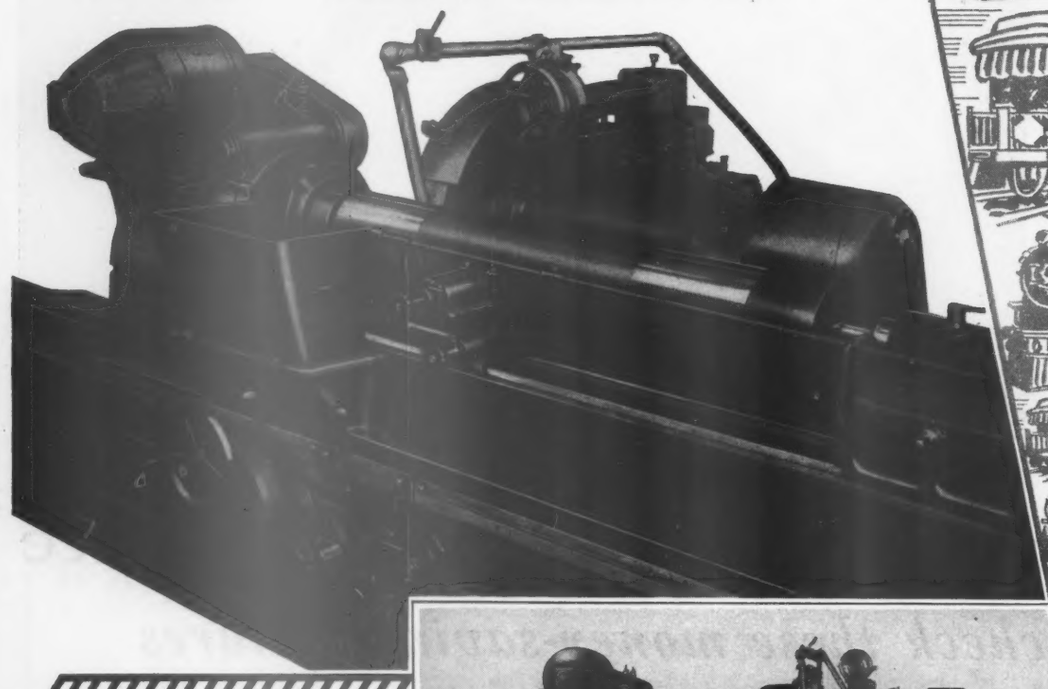
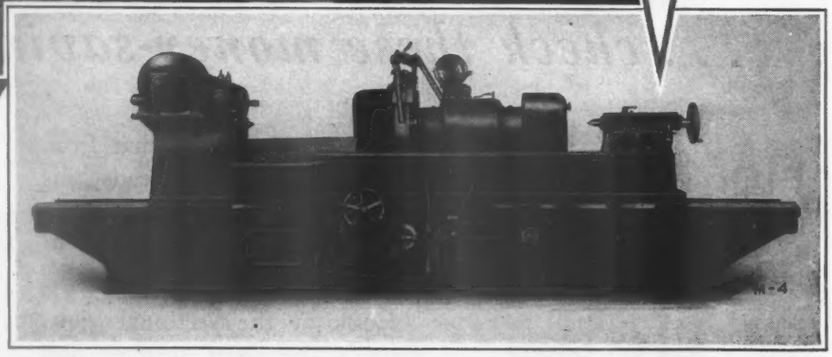
16" X 96" TYPE B HYDRAULIC GAP GRINDER





TRAINS must come and trains must go but axles will not go on forever.

They will run longer and smoother if they are ground; particularly if they are ground on the new Landis Hydraulic Gap Grinder. And because they will run longer without attention they cut down operating costs to an amazing extent.

Not locomotive or car axles alone but piston rods and valve yoke stems—yes, many other parts too—respond equally well to the "Landis Treatment"

Catalogue No. I-28 gives many reasons why.

LANDIS TOOL COMPANY
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Season's Greetings

It is our sincere wish that the bells of Yule-tide are ushering in for you a new era of happiness and prosperity.

It is gratifying to find that there is still an appreciation of real values, and we are deeply grateful for the fact that an ever-increasing number of satisfied users bear witness to the efficiency and economy of Wyandotte Products.

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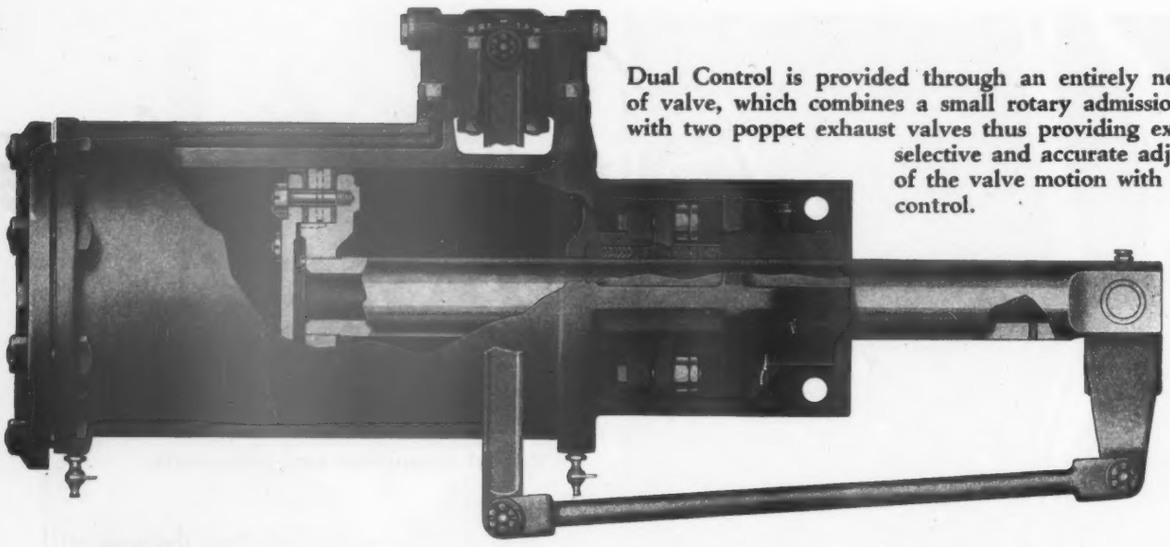


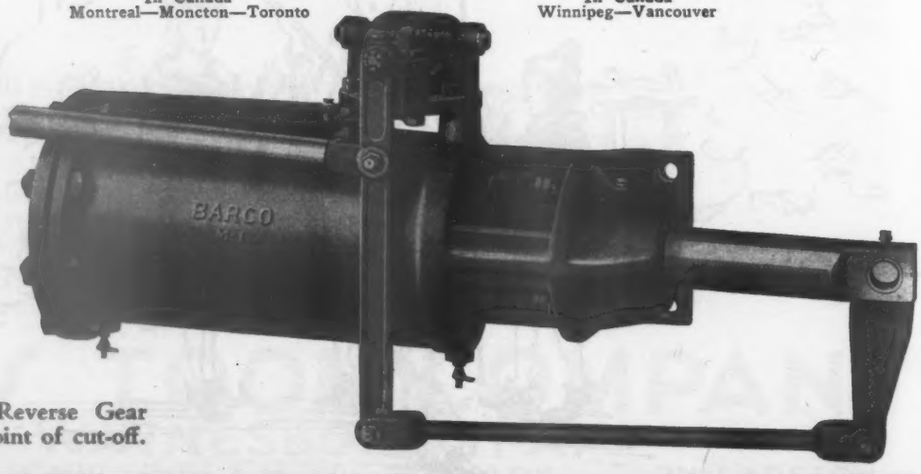
Dual Control is provided through an entirely new type of valve, which combines a small rotary admission valve with two poppet exhaust valves thus providing extremely selective and accurate adjustment of the valve motion with positive control.

New Type M-1 BARCO

Dual Control Power Reverse Gear

LOW initial cost, simplicity of installation, economical performance, extremely fine, precision adjustment, and accurate control are the outstanding advantages of this *new* BARCO Power Reverse Gear.

Among the other new features which will appeal to supervisors of locomotive operation and maintenance are: *light weight -- minimum parts -- one cylinder head -- no guides or crossheads -- rugged construction -- standard bolting arrangement,* and *unique design which insures perfect alignment and relieves strain on rod packing.* Complete details and blueprints upon request.



A balanced pressure Power Reverse Gear that accurately controls the point of cut-off.

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A Piston Rod Sleeve Protector

Now Available for Freight Brake Cylinders

A simple device that has been furnished for many years with locomotive driver, truck, and tender brake cylinders is now available for FREIGHT Brake Cylinders —a Piston Rod Sleeve Protector.

This is a collar that may be riveted to the hollow rod and thus form a ready means of holding the assembled piston, release spring, and non-pressure head together during cleaning operations, and to protect the rod from becoming battered at its outer end.

This Piston Rod Sleeve Protector is applicable to all existing freight brake equipment as well as new . . . Complete information concerning it is given in Circular Notice No. 1101—a copy is yours for the asking.

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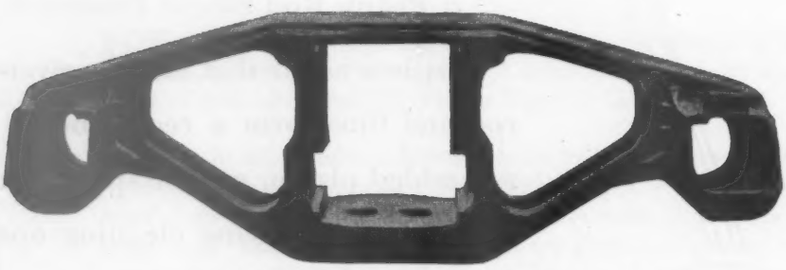
REPAIR RESTORE REPLACE

ANTICIPATING savings by withholding appropriation for adequate maintenance of freight equipment is not true economy.

Obsolete trucks or ones allowed to deteriorate from lack of needed repairs can jeopardize safe train operation and cause losses greatly in excess of the cost of corresponding new replacement parts.



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The low maintenance expense of integral box cast steel side frames is always the deciding factor in modernizing arch bar trucks.

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For Locomotive, Marine and Power Plant Service

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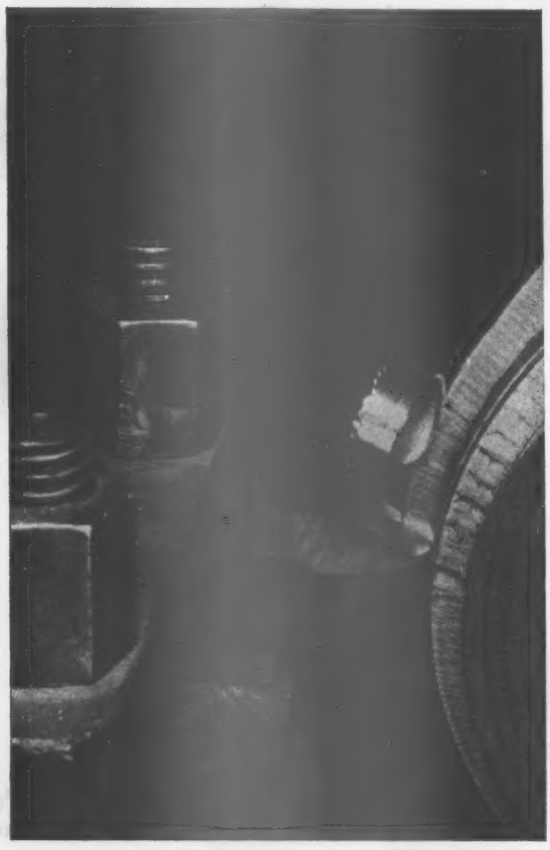
NATIONAL SEAMLESS

Impressive economies result from using this tool steel



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Carnegie Wrought Steel Wheels

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December, 1932

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Say good-bye, once and for all, to hot boxes.
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TIMKEN Tapered Roller BEARINGS

35¢

December, 1932

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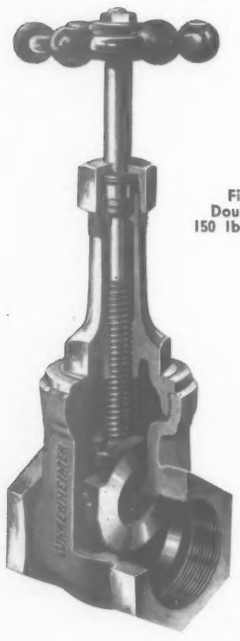

Fig. 427
Double Disc
150 lb. W. S. P.

Fig. 768
Wedge Disc
200 lb. W. S. P.

Figs. 427 and 768
BRONZE
Gate Valves

Well and favorably known in industrial plants all over the country, these valves fully justify the confidence placed in them. Their reputation for stamina and serviceability is the natural result of many years of satisfactory service under varied operating conditions.

Figs. 427 and 768 are made of a bronze composition developed particularly for valve service. Wall sections of extra thickness and large hexagons resist distortion. Proper seating of discs is insured by accurate alignment of moving parts.

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Vol. 106 No. 12

Published monthly by Simmons-Boardman Publishing Company, 1309 Noble Street, Philadelphia, Pa. Entered as second class matter, March 10, 1928, at the Post Office at East Stroudsburg, Pa., under the Act of March 3, 1879. Application pending transfer as second class matter to Philadelphia, Pa., Post Office.

Your stake in the railroads

. . . and ours

WE are all in the same boat with respect to the the necessity for a restoration of the economic health of the railroads. Whether we be manufacturer, farmer, legislator, banker, business or professional man . . . each and every one of us is touched in our pocketbooks by the need of the railroads to earn a fair dividend or interest rate. For when that fair rate cannot be earned, our bank deposits, our insurance policies, the basic structure of all our investments designed to provide a competence against the inevitable rainy day, is irreparably weakened.

Safe, swift, efficient and adequate rail transportation is the essential system of arteries and veins through which the very life-blood of commerce flows. That system cannot be broken down without disrupting the economic health of the whole country. From the greatest city to the smallest hamlet in the land, there is a constant interplay of goods and services dependent upon the railroads. That interplay . . . smooth, swift, unhampered . . . is the basis of modern civilization. Stop every train on every railroad for one short week, and chaos, starvation, and anarchy would over-run the nation.

The railroads are struggling against terrific odds to make a living . . . for themselves *and* for you *and* for us. Many of those odds have been stacked against the railroads by a mistaken sense of justice. It is time to look the situation squarely in the face and to grant the railroads necessary measures of relief from unjust taxation, from over-regulation, from unfair competition, from unmerited suspicion. It is time to acknowledge the share of debt we owe to the railroads for their very large part in the building of our nation. It is time to help them in their arduous struggles to maintain at an *adequate* and *efficient* level this life-blood service.

Our own endeavors during many years past have centered largely on the design and construction of locomotive feedwater heaters of such high efficiency and lasting durability as to effect material economies in locomotive operation and maintenance costs. In the face of extremely limited budgets for rolling stock improvement, some 103 railroads have, during the past five years, purchased a very considerable number of these locomotive feedwater heaters because those purchases have saved many times their cost in the reduction of operating and maintenance charges.

Your stake in the railroads may not include the sale of equipment . . . it is none the less just as vital in its effects upon general business conditions and the security of billions of invested capital, as well as upon the relief of the unemployment situation. The situation is urgent . . . act now!

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